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ABSTRACT

This document contains teacher and student materials for a course in graphic arts concentrating on camera work, stripping, and plate making in the printing process. Eight units of instruction cover the following topics: (1) the process camera and darkroom equipment; (2) line photography; (3) halftone photography; (4) other darkroom techniques; (5) overview of process color photography; (6) stripping procedures; (7) platemaking procedures; and (8) digital impact on prepress activities. The teacher edition contains some or all of the following components of a unit of study: suggested activities, instructor supplements, assignment sheet answers, written test, written test answers, unit evaluation form, and transparency masters. The teacher edition also includes introductory pages that contain, in addition to the general information such as the table of contents, foreword, and acknowledgments, an explanation of the use of the publication, a competency profile, an instructional task analysis, a list of related academic and workplace skills, a tools, equipment and materials list, and a list of 26 references. Each unit of the student edition contains some or all of the following components: objective sheet, information sheet, student supplements, assignment sheets, and job sheets. (KC)

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ED 410 418

GRAPHIC ARTS

PROCESS CAMERA STRIPPING PLATEMAKING

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TEACHER EDITION

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MAVCC

Graphic Arts

Process Camera, Stripping, and Platemaking

Third Edition

Teacher Edition

Revised by

Dan Crummett

Project Coordinated by

Jane Huston

Developed by

The Multistate Academic and Vocational Curriculum Consortium, Inc.

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Graphic Arts
Process Camera, Stripping, and Platemaking
Third Edition

Teacher Edition

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Foreword

Graphic Arts: Process Camera, Stripping, and Platemaking is the second in a series of instructional materials on graphic communication developed by the Multistate Academic and Vocational Curriculum Consortium (MAVCC). This publication addresses the new technologies that are changing the printing industry and introduces basic concepts and skills necessary for a student to be employed in an entry-level graphic communication occupation. Additional instructional materials have been developed for *Graphic Arts: Orientation, Composition, and Paste-Up; Graphic Arts: The Press and Finishing Processes; and Basics of Desktop Publishing.*

Teachers are encouraged to read the suggested activities section for each unit of instruction and to make arrangements for those activities they plan to include as part of their instruction. These materials are designed so that teachers may localize/personalize/supplement the units to fit class interests, individual learning styles, and various instructional methods, and to incorporate new and emerging technologies and processes.

Special attention should be given to the matrix identifying basic academic and workplace skills being reinforced in these instructional materials. A chart which classifies and defines each of the academic and workplace skills and competencies has been included in the teacher edition and reflects key elements from *What Work Requires of Schools: A SCANS Report for America 2000*, a 1991 study by the U.S. Department of Labor; *Workplace Basics: The Skills Employers Want*, a three-year study conducted jointly by the American Society for Training and Development (ASTD) and the United States Department of Labor (DOL); and other national and state sources. These tools have been provided in an effort to help educators identify and document where basic academic and workplace skills are being taught. By reinforcing these skills, the teacher should assist students in improving their employability skills.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please call or write us.

Jean McEntire, Chair
Board of Directors
Multistate Academic and
Vocational Curriculum Consortium

Clark R. Harris
Executive Director
Multistate Academic and
Vocational Curriculum Consortium

Acknowledgements

Appreciation is extended to those individuals who contributed their time and talent to the revision of *Graphic Arts: Process Camera, Stripping, and Platemaking.*

Well-deserved thanks go to the many industry and education representatives who participated as members of MAVCC's graphic arts committees throughout the years. Their assistance in developing and reviewing these instructional materials has been an essential step in MAVCC's development process. Thanks are also extended to the various companies that provided reference materials and artwork for the graphic arts series.

Special recognition is given to John Koonce for revising the first edition, and to the authors of the original publication—Karim Farajollahi, Gary Ogle, William Reed, and Kenneth Woodcock.

Thanks are also extended to Debra Gregor and Danny Hoggatt, graphic communication instructors, Central Tech, Drumright, Oklahoma; Larry Smith, of the "Copy Shop" at Frontier Printers; and to Diane Kessler and Randy Seales, employees of the Graphics Division of the Oklahoma Department of Vocational and Technical Education, for their assistance and support in revising the graphic arts series.

Special appreciation is extended to Jerrie Crummett for her assistance in electronic publishing, and to the employees of the Graphics Division of the Oklahoma Department of Vocational and Technical Education for printing this publication.

A final thank you to Jane Huston for coordinating this project.

Use of Introductory Materials

Introductory materials are included in the teacher edition only and contain useful information to assist administrators and teachers in planning for instruction.

In addition to the general information such as the table of contents, foreword, and acknowledgements, information is included on the following:

1. **Use of this publication**—Explains the components of a unit of instruction and how they should be used as part of the teaching/learning process.

2. **Competency profile**—Provides a record of student performance for each task included in a unit of instruction. This becomes a part of the student's permanent records and should be utilized when directing the student toward employment opportunities.

3. **Instructional/task analysis**—Provides a quick review of contents of the publication; identifies cognitive (knowledge) skills and psychomotor (doing) skills addressed in each unit of instruction.

4. **Related academic and workplace skills list**—Classifies unit tasks (assignment sheets and job sheets) according to related academic and workplace skills and competencies being reinforced. Skill areas reflected by skill groups, sub skills, and definitions have been identified using *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want.*

5. **Tools, equipment, and materials list**—Provides a comprehensive list of those items needed to successfully complete the assignment sheets and/or job sheets; assists administrator/teacher in determining program costs.

6. **Reference list**—Provides a comprehensive list of resources used in the development of this publication.

As you use these materials, it is hoped that they will provide useful information to meet a variety of needs.

Use of This Publication

Graphic Arts: Process Camera, Stripping, and Platemaking contains eight units of instruction. For the teacher edition, the pages are divided into teacher pages and student pages. These include the following:

Teacher Pages	Student Pages
Suggested Activities	Objective Sheet
Answers to Assignment Sheets*	Information Sheet
Written Test	Student Supplements*
Answers to Written Test	Assignment Sheets*
Unit Evaluation Form	Job Sheets*
Transparency Masters*	

* *Designates components that may not appear in every unit of instruction*

The complete teacher edition consists of both teacher pages and student pages, as well as the introductory pages. Student pages focus on measurable and observable learning outcomes. Teacher pages provide evaluation tools and suggestions on ways to supplement, localize, personalize, and motivate in order to present a complete teaching/learning process.

MAVCC instructional materials are competency-based, not time-based. Students should be allowed to work until they master each competency.

Units of instruction are designed for use in more than one lesson or class period. Careful study of each unit of instruction by the teacher will help to determine the following:

- Amount of materials that can be covered in each class period
- Skills that must be demonstrated
- Amount of class time needed for teacher demonstrations
- Amount of time needed for student practice
- Supplementary materials, including print and nonprint media and equipment and supplies, that must be ordered.
- Resource people who must be contacted

Teacher Pages

Suggested Activities

This component is included only in the teacher edition. The suggested activities assist teachers during the preparation stage of the teaching/learning process by providing teaching suggestions and a list of supplemental resources. The teacher should read the suggested activities before teaching the units and decide how each objective can best be taught. Time should also be allowed to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the teacher will vary according to the particular unit.

To assist a teacher in obtaining suitable supplemental materials, references used in the development of each unit are listed in this component, along with suggested supplemental resources such as books, posters, pamphlets, videotapes, and computer software.

Assignment and Written Test Answers

These are designed to assist the teacher in evaluation of student performances.

Written Test

This component provides criterion-referenced evaluation of every cognitive objective listed in the unit of instruction. The written test may be duplicated for student use. If objectives have been added, deleted, or modified, appropriate changes should be made on the written test. It is recommended that the tests be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of test items from the units covered may be used for final tests at the end of each term if desired.

Unit Evaluation Form

This sheet provides teachers with a record of each student's performance on a unit of instruction. It includes space for assignment sheet ratings, job sheet ratings, written test scores, and teacher comments. The unit evaluation form may be duplicated.

Transparency Masters

Transparency masters are used to direct the students' attention to the topic of classroom discussion. They may provide illustrations, charts, schematics, or additional information needed to clarify and reinforce objectives included in the unit of instruction.

Student Pages

Objective Sheet

Each unit of instruction is based on performance objectives which state the goals for successful completion of the course. These performance objectives are stated in two forms: unit objectives which state the expected performance of each student after completion of the unit of instruction, and specific objectives which state what the student must do to reach the unit objective.

The objectives should be stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Teachers should prepare for each unit by deciding how each objective can best be taught.

Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the teacher should remember to supply the needed information, assignment and/or job sheets, and written test items.

Information Sheet

The information sheet provides the content essential for meeting the cognitive (knowledge) objectives of the unit. Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. Students should read the information sheet before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide information for the teaching of each objective.

Student Supplements

The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment and/or job sheets. Students are not directly tested over the information presented in a supplement; however, their ability to apply this information may be evaluated in the completion of assignment sheets and/or job sheets.

Assignment Sheets

Assignment sheets provide students with pencil and paper activities that give students the opportunity to make practical application of the knowledge in the information sheet.

Job Sheets

Job sheets are an important segment of each unit. Job sheets provide potential employers with a picture of the skills being taught during training and the performances that might reasonably be expected from an individual who has had this training.

The job sheets provide criteria to objectively evaluate student performance, a list of required equipment and materials, and a step-by-step procedure for performing a psychomotor skill. The teacher should discuss the equipment and materials available in the classroom, laboratory, or shop and demonstrate the procedure prior to having students practice the procedure. When a student is ready to be evaluated, the teacher should follow instructions for evaluating student performance shown below.

Instructions For Evaluating Student Performance

When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Graphic Arts
Process Camera, Stripping, and Platemaking

Competency Profile

Name: _____

Directions: Evaluate the student using the rating scale below. Write the appropriate number to indicate the degree of competency achieved. The descriptions associated with each of the numbers focus on a level of student performance for each of the tasks listed. The written test scoreline is provided for optional teacher use. It may not be applicable in all cases.

Option A

Rating scale:
4 – Skilled – Can perform job with no additional training.
3 – Moderately Skilled – Has performed job during training program; limited additional training may be required.
2 – Limited Skill – Has performed job during training program; additional training is required to develop skill.
1 – Unskilled – Is familiar with process, but is unable to perform job.
0 – No Exposure – No information or practice provided during training program, complete training required.
NA – Non-applicable.

Option B

Yes – Can perform with no additional training
No – Is unable to perform satisfactorily

Unit I: The Process Camera and Darkroom Equipment

_____ 1. Collect types of copy.
_____ 2. Complete a darkroom safety worksheet.
_____ 3. Prepare a darkroom for tray processing, and expose and develop a line negative.
_____ 4. _____
_____ 5. _____

_____ Written Test Score

Unit II: Line Photography

_____ 1. Apply an exposure rule for different steps on the gray scale.
_____ 2. Set up a process camera and determine exposures.
_____ 3. _____
_____ 4. _____

_____ Written Test Score

Unit III: Halftone Photography

_____ 1. Identify halftone dot percentages.
_____ 2. Program a Q15 exposure computer and make a halftone negative.
_____ 3. Make a duotone.
_____ 4. Make a fake duotone.
_____ 5. Rescreen a halftone illustration.
_____ 6. _____
_____ 7. _____

_____ Written Test Score

Unit IV: Other Darkroom Techniques

_____ 1. Determine basic exposure and make a diffusion transfer line print.
_____ 2. Program a Q15 exposure computer and make a diffusion transfer halftone print.
_____ 3. Make a two-tone posterization using special effects screen and diffusion transfer material.
_____ 4. Make a three-tone posterization using special effects screen and diffusion transfer material.
_____ 5. Make a three-color posterization using graphic arts film.
_____ 6. Make a duplicate negative and a film positive using graphic arts film.
_____ 7. Make a spread and a choke using graphic arts film.
_____ 8. Make a combination print with reversed type overprinted in a second color.
_____ 9. _____
_____ 10. _____

_____ Written Test Score

Unit V: Overview of Process Color Photography

_____ 1. Make a set of unmasked direct screen four-color separation negatives.
_____ 2. Make an acetate overlay proof.
_____ 3. _____
_____ 4. _____

_____ Written Test Score

Unit VI: Stripping Procedures

_____ 1. Lay out and strip an unruled flat.
_____ 2. Strip a ruled flat.
_____ 3. Strip for step-and-repeat.
_____ 4. Combine line and halftone work.
_____ 5. Strip for combination print.
_____ 6. Strip complementary flats for multi-color printing.
_____ 7. Lay out signature flats for multi-page or book printing.
_____ 8. Strip a two-color job using print register and masking film.
_____ 9. Expose a blue-line proof.
_____ 10. _____
_____ 11. _____

_____ Written Test Score

Unit VII: Platemaking Procedures

_____ 1. Expose and develop a subtractive plate.
_____ 2. Determine plate exposure using a step-off test.
_____ 3. Expose a step-and-repeat plate.
_____ 4. Expose a plate when using a screen tint.
_____ 5. Make plates for a two-color job.
_____ 6. Expose a photo-direct plate
_____ 7. _____
_____ 8. _____

_____ Written Test Score

Competency Profile

Unit VIII: Digital Impact on Prepress Activities

_____ 1. Collect current event material concerning changes in staffing and training needs for personnel in the printing industry.
_____ 2. Compare and contrast the changes in staffing and training needs in a typical print shop which adopts CTP technology.
_____ 3. Analyze the effects of digital technology on the printing industry as it applies to the printer's and the customer's viewpoint of cost, customer service, and competitiveness.
_____ 4. Create a camera-ready laser copy of a page containing text, graphics, and headlines.
_____ 5. _____
_____ 6. _____

_____ Written Test Score

COMMENTS:

_____

_____

_____

_____

Evaluator: _____ Date: _____

* Permission to duplicate this profile is granted.

Graphic Arts
Process Camera, Stripping, and Platemaking

Instructional/Task Analysis

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do

Unit I: The Process Camera and Darkroom Equipment

1. Definition of a process camera
2. Types of process cameras
3. Parts of a process camera
4. Functions of parts of a process camera
5. Type of camera copy
6. Darkroom equipment/supplies
7. Types of camera film
8. Darkroom cleanliness
9. Darkroom safety
10. Interpret Hazardous Materials Identification System (HMIS) labels
11. Collect types of copy
12. Complete a darkroom safety worksheet
13. Prepare a darkroom for tray processing, and expose and develop a line negative

Unit II: Line Photography

1. Terms and definitions
2. Principles of line photography
3. Types of film base material
4. Types of emulsion
5. Degrees of density
6. Exposure rule for recording density
7. Parts of a typical lens assembly
8. Characteristics of an aperture
9. Functions of filters
10. Apply an exposure rule for different steps on the gray scale
11. Set up a process camera and determine exposures

Unit III: Halftone Photography

1. Terms and definitions
2. Type of contact screens
3. Care of contact screens
4. Halftone dot percentages
5. Procedures for avoiding moires in rescreening
6. Identify halftone dot percentages
7. Program a Q15 Exposure Computer and make a halftone negative
8. Make a duotone
9. Make a fake duotone
10. Rescreen a halftone illustration

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do

Unit IV: Other Darkroom Techniques

1. Terms and definitions
2. Care of a diffusion transfer processor
3. Materials and equipment necessary to make a diffusion transfer print
4. Determine basic exposure and make a diffusion transfer line print
5. Program a Q15 Exposure Computer and make a diffusion transfer halftone print
6. Make a two-tone posterization using diffusion transfer material
7. Make a three-tone posterization using special effects screen and diffusion transfer material
8. Make a three-color posterization using graphic arts film
9. Make a duplicate negative and a film positive using graphic arts film
10. Make a spread and a choke using graphic arts film
11. Make a combination print with reversed type overprinted in a second color

Unit V: Overview of Process Color Photography

1. Terms and definitions
2. Additive and subtractive primary colors
3. Functions of printing inks
4. Color separation
5. Methods for making color corrections
6. Make a set of unmasked direction screen four-color separation negatives
7. Make an acetate overlay proof

Unit VI: Stripping Procedures

1. Terms and definitions
2. Stripping tools and materials
3. Parts on a layout of a typical flat
4. Emulsion side and base side of a negative
5. Methods of combining line and halftone work
6. Types of combination printing
7. Stripping register marks and pins
8. Layout and strip an unruled flat
9. Strip a ruled flat
10. Strip for step-and-repeat
11. Combine line and halftone work
12. Strip for combination print (double burn)
13. Strip complementary flats for multi-color printing
14. Lay out signature flats for multi-page or book printing

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do
Unit VI: Stripping Procedures (cont.)	
	15. Strip a two-color job using pin register and masking film
	16. Expose a blue-line proof
Unit VII: Platemaking Procedures	
1. Terms and definitions	9. Expose and develop a subtractive plate
2. Types of plate ends	10. Determine plate exposure using a step-off test
3. Types of offset plates	11. Expose a step-and-repeat plate
4. Plate exposing devices	12. Expose a plate when using a screen tint
5. Types of presensitized plates	13. Make plates for a two-color job
6. Gumming of plates	14. Expose a photo-direct plate
7. Handling and storing plates	
8. Do's and don'ts for properly handling of plates and chemicals	
Unit VIII: Digital Impact on Prepress Activities	
1. Terms and definitions	7. Collect current event material concerning changes in staffing and training needs for personnel in the printing industry
2. Types of digital printing systems	8. Compare and contrast the changes in staffing and training needs in a typical print shop which adopts CTP technology
3. Three types of computer-to-plate printing systems	9. Analyze the effects of digital technology on the printing industry as it applies to the printer's and the customer's viewpoint of cost, customer service and competitiveness.
4. Unique capability of computer-to-print systems	10. Create a camera-ready laser copy of a page containing text, graphics and headlines using instructor-supplied hardware, and desktop publishing software
5. Three technologies using computer-to-print engineering	
6. Traditional printing vs. digital printing	

Academic and Workplace Skills
(Classifications and Definitions)

Foundation Skills		
Skill Groups	**Sub Skills**	**Definitions**
Basic Skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task.
	Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner.
	Arithmetic/ mathematics	Performing basic computations, applying estimating and reasoning skills, and solving practical problems using a variety of mathematical techniques.
	Science	Applying knowledge learned through study or practice that is based on scientific principles, methods, and techniques.
	Listening	Receiving, interpreting, and responding to oral messages and other cues.
	Speaking	Communicating a thought, idea, or fact orally in a clear, concise manner.
Thinking Skills	Creative thinking	Using imagination to generate new ideas.
	Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative.
	Problem solving	Recognizing and defining problems, devising and implementing plan of action, and tracking and evaluating results.
	Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information.
	Knowing how to learn	Using efficient learning techniques to acquire and apply new knowledge and skills.
	Reasoning	Applying a rule or principle underlying the relationship between two or more objects when solving a problem.
Personal Management Skills	Responsibility	Exerting a high level of effort towards goal attainment, working hard to become excellent at doing tasks by setting high standards, paying attention to details, and displaying a high level of concentration.
	Self-esteem	Developing self-confidence and creating a positive self-image.
	Career awareness, development, and mobility	Assessing self accurately, setting personal goals, establishing and implementing a plan, and monitoring progress.
	Integrity/honesty	Choosing an ethical course of action when faced with making a decision that may break with personal or societal values and recognizing the impact of violating these beliefs and codes on an organization, self, and others.
	Organizational effectiveness	Adapting to the organization's goals, values, culture, and traditional modes of operation.

Competencies		
Skill Groups	**Sub Skills**	**Definitions**
Resources	Time	Selecting relevant, goal-related activities, ranking them in order of importance, allocating time, and understanding, preparing, and following schedules.
	Money	Using or preparing budgets, making forecasts, keeping records, and making adjustments to meet objectives.
	Material and facilities	Acquiring, storing and using materials and space efficiently.
	Human resources	Assessing skills and distributing work accordingly; evaluating performance and providing feedback.
Interpersonal Skills	Teamwork	Working cooperatively with others to reach a common goal.
	Coaching	Helping others learn new skills.
	Leadership	Communicating ideas to justify position; accepting responsibility for others; and encouraging, persuading, convincing, or otherwise motivating an individual or group.
	Negotiation	Resolving conflict between two or more individuals through discussion and compromise.
	Customer service	Working and communicating with customers to satisfy their expectations.
	Cultural diversity	Working well with men and women and with a variety of ethnic, social, or educational backgrounds.
Information	Acquisition and evaluation	Identifying need for data, obtaining it from existing sources or creating it, and evaluating its relevance and accuracy.
	Organization and storage	Organizing, processing, and maintaining written or computerized records and other forms of information in a systematic way.
	Interpretation	Selecting and analyzing information and communicating the results to others.
	Processing	Using computers to acquire, organize, analyze, and communicate information.
Systems	Interrelationships	Knowing how social, organizational, and technological systems work and operate effectively.
	Monitoring	Distinguishing trends, predicting impact of actions on system operations, diagnosing deviations in systems' performance, and correcting malfunctions.
	Modification and design	Making suggestions to modify existing systems to improve products or services, and developing new or alternative systems.
Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies.
	Application	Demonstrating proper procedures for setting up and operating equipment.
	Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies.

Related Academic and Workplace Skills List
For *Graphic Arts*
Process Camera, Stripping, and Platemaking

Task	Skill Group	Sub Skill	Description
Unit I: The Process Camera and Darkroom Equipment			
Collect types of copy (A.S. 1)	Basic Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Writes/prints legibly
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
Complete a darkroom safety worksheet (A.S. 2)	Basic Skills	Reading	Recalls important details from written information; follows written directions
		Writing	Presents answers in a clear and understandable form
Prepare a darkroom for tray processing, and expose and develop a line negative (J.S. 1)	Basic Skills	Reading	Follows written directions; comprehends written information and applies it to a task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Unit II: Line Photography			
Apply an exposure rule for different steps on the gray scale (A.S. 1)	Basic Skills	Reading	Follows written directions
		Math	Applies mathematical principle to solve a problem
Set up a process camera and determine exposures (J.S. 1)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies mathematical formula to solve a problem
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials

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Task	Skill Group	Sub Skill	Description
Unit III: Halftone Photography			
Identify halftone dot percentages (A.S. 1)	Basic Skills	Reading	Follows written directions
Program a Q15 exposure computer and make a halftone negative (J.S. 1)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Make a duotone (J.S. 2)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job; uses measuring device to construct lines and angles
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment

Task	Skill Group	Sub Skill	Description
Unit III: Halftone Photography (cont.)			
Make a fake duotone (J.S. 3)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Rescreen a halftone illustration (J.S. 4)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Unit IV: Other Darkroom Techniques			
Determine basic exposure and make a diffusion transfer line print (J.S. 1)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment

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Task	Skill Group	Sub Skill	Description
Unit IV: Other Darkroom Techniques (cont.)			
Program a Q15 exposure computer and make a diffusion transfer halftone print (J.S. 2)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Make a two-tone posterization using diffusion transfer material (J.S. 3)	Basic Skills	Reading	Follows written directions; reads and follows instructions to operate technical equipment
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Make a three-tone posterization using special effects screen and diffusion transfer material (J.S. 4)	Basic Skills	Reading	Follows written directions; reads and follows instructions to operate technical equipment
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Make a three-color posterization using graphic arts film (J.S. 5)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation

Task	Skill Group	Sub Skill	Description
Unit IV: Other Darkroom Techniques (cont.)			
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Make a duplicate negative and a film positive using graphic arts film (J.S. 6)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Make a spread and choke using graphic arts film (J.S. 7)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment

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Task	Skill Group	Sub Skill	Description
Unit IV: Other Darkroom Techniques (cont.)			
Make a combination print with reversed type overprinted in a second color (J.S. 8)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Unit V: Overview of Process Color Photography			
Make a set of unmasked direct screen four-color separation negatives (J.S. 1)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Make an acetate overlay proof (J.S. 2)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; reads and follows instructions to operate technical equipment
		Math	Applies computation skills as they are used on the job
	Thinking Skills	Reasoning	Applies rules and principles to a new situation

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit V: Overview of Process Color Photography (cont.)			
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Unit VI: Stripping Procedures			
Lay out and strip an unruled flat (J.S. 1)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
		Math	Takes measurements using common measuring devices
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Strip a ruled flat (right reading) (J.S. 2)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
		Math	Takes measurements using common measuring devices
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Strip for step-and-repeat (J.S. 3)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
		Math	Takes measurements using common measuring devices
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials

Task	Skill Group	Sub Skill	Description
Unit VI: Stripping Procedures (cont.)			
Combine line and halftone work (J.S. 4)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Strip for combination print (double burn) (J.S. 5)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Strip complementary flats for multi-color printing (J.S. 6)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Lay out signature flats for multi-page or book printing (J.S. 7)	Basic Skills	Reading	Comprehends written information and applies it to a task
Strip a two-color job using pin register and masking film (J.S. 8)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Expose a blue-line proof (J.S. 9)	Basic Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Thinking Skills	Reasoning	Applies rules and principles to a new situation

Task	Skill Group	Sub Skill	Description
Unit VI: Stripping Procedures (cont.)			
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
	Technology	Application	Demonstrates the proper procedure for setting up and operating equipment
Unit VII: Platemaking Procedures			
Expose and develop a subtractive plate (J.S. 1)	Basic Skills	Reading	Applies/understands technical words that pertain to subject; comprehends written information and applies it to a task; follows written directions
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Determine plate exposure using a step-off test (J.S. 2)	Basic Skills	Reading	Analyzes and applies what has been read to a specific task; follows written directions
		Math	Applies mathematical principles to solve a problem
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Expose a step-and-repeat plate (J.S. 3)	Basic Skills	Reading	Applies/understands technical words that pertain to subject; comprehends written information and applies it to a task; follows written directions
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions

Task	Skill Group	Sub Skill	Description
Unit VII: Platemaking Procedures (cont.)			
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Expose a plate when using a screen tint (J.S. 4)	Basic Skills	Reading	Applies/understands technical words that pertain to subject; comprehends written information and applies it to a task; follows written directions
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Make plates for a two-color job (J.S. 5)	Basic Skills	Reading	Applies/understands technical words that pertain to subject; comprehends written information and applies it to a task; follows written directions
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials
Expose a photo-direct plate (J.S. 6)	Basic Skills	Reading	Applies/understands technical words that pertain to subject; comprehends written information and applies it to a task; follows written directions
	Thinking Skills	Reasoning	Applies rules and principles to a new situation
		Problem solving	Draws conclusions from observations and evaluates situation and gives possible solutions
	Resources	Material and facilities	Organizes work space for optimum productivity; uses equipment and materials correctly; demonstrates safe use of equipment and materials

Task	Skill Group	Sub Skill	Description
Unit VIII: Digital Impact on Prepress Activities			
Collect current event material concerning changes in staffing and training needs for personnel in the printing industry (A.S. 1)	Basic Skills	Reading	Uses written resources to obtain factual information; follows written directions
	Thinking Skills	Knowing how to learn	Locates appropriate learning resources to acquire or improve knowledge and skills
	Personal Management Skills	Career awareness, development, and mobility	Explores career opportunities
	Information	Acquisition and evaluation	Acquires information from existing resources
Compare and contrast the changes in staffing and training needs in a shop adopting CTP technology (A.S. 2)	Basic Skills	Reading	Comprehends written information for main ideas; follows written directions
		Writing	Composes and creates a report; applies rules of grammar, punctuation, capitalization, and spelling
	Thinking Skills	Creative thinking	Combines ideas or information in a new way
		Reasoning	Compares two or more ideas using written information; uses logic to draw conclusions
		Problem solving	Recognizes/defines problem and identifies possible reasons for problem
Analyze effects of digital printing on the printer's and customer's view of cost, service, and competitiveness (A.S. 3)	Basic Skills	Reading	Comprehends written information for main ideas; follows written directions
		Writing	Composes and creates a report; applies rules of grammar, punctuation, capitalization, and spelling
	Thinking Skills	Creative thinking	Combines ideas or information in a new way
		Reasoning	Compares two or more ideas using written information; uses logic to draw conclusions
		Problem solving	Recognizes/defines problem and identifies possible reasons for problem

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Task	Skill Group	Sub Skill	Description
Unit VIII: Digital Impact on Prepress Activities (cont.)			
Create a camera-ready laser copy of a page containing text and graphics (J.S. 1)	Basic Skills	Reading	Follows written directions; reads text to input on computer
	Technology	Application	Demonstrates proper procedure for operating equipment

Graphic Arts
Process Camera, Stripping, and Platemaking

Tools, Equipment, and Materials List

Absorbent paper
Acetate overlays
Activator
Amber or ruby peel coat

Black fine or medium point pen
Black photographic tape
Blue-line proofing material

Cheese cloth
Color key
Contact frame/vacuum printer
Contact screens
Continuous tone copy
Cotton pads

Darkroom equipment
Darkroom timer
Desktop publishing program
Developer
Diffusion transfer activator
Diffusion transfer gray contact screen
Diffusion transfer negative paper
Diffusion transfer processor
Diffusion transfer receiver paper
Duplicating film

Filters
Filter holder
Fixer solution
Flash lamp, 7½ watt bulb
Flats

Glass cleaner and wipes
Graduate
Graphic arts film
Graphic file
Gray scale

Halftone film

Illustration board

Kodak Color Separation Guide
Kodak Direct Screen Calculator, Q-10B
Kodak Q15 Exposure Computer
Kodak 24-Step Reflection Density Guide, Q-16

Laser printer
Light table
Line gauge

Litho film
Litho tape

Magnifier, 10-power
Masking tape

Negatives

Panchromatic film
Paper pad
Paper towels
Paste-up equipment
Personal computer
Photo-direct platemaker
Plate exposure device
Plate processing chemicals
Preangled chipboard
Presensitized subtractive plate
Process camera
Protractor

Register marks
Register punch and pins
Ruled masking sheet
Ruler

Scissors
Sink
Spacer material
Sponge or pad applicator
Squeegee
Stop bath
Storage containers
Stripping equipment
Stripping knife

Tape dispenser
Templates
Text file
Thermometer
Transparent tape
Trays
Triangle
T-square

Unruled masking sheet

Vacuum exposing unit

White card stock

References

Bentley, R.G.; J.C. Olson; C.E. Strandberg, and R.E. Wiper. *Graphic Communications Series: Transparency Originals.* Chicago, IL: A.B. Dick Company.

Blair, Ray and Thomas M. DeStree. *The Lithographers Manual.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

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Knittel, Patricia A. *Creating Special Effects with Posterization.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

Koonce, John W. *Graphic Arts Photography: An Individualized Approach.* Emporia, KS: Emporia State University Press.

Pocket Pal, A Graphic Arts Handbook. Memphis, TN: International Paper Co., 1992.

PageMaker 5.0 Introduction, Student Manual. Rochester, NY: Logical Operations, 1993.

Schneider, Robert J. *Diffusion Transfer.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

3-M Imaging Systems Group. *Press Operator's Guide.* St. Paul, MN: 3-M Printing and Publishing Systems, 1989.

(NOTE: This publication contains platemaking information formerly found in the 3-M *Platemaker's Guide* which is no longer in print.)

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit. Distribute photocopies of TM 2-3 to students for part identification of process cameras.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives. Be certain to note equipment and processes in this unit are rapidly being digitized and relegated to computer tasks. See Unit 8.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

G. Provide students with job sheet.

H. Discuss and demonstrate the procedures outlined in the job sheet.

(NOTE: Assignment Sheet #1 must be completed before starting Job Sheet #1. Students will use their copy collection to complete this activity.)

I. Integrate the following activities throughout the teaching of this unit:

1. Discuss advantages and disadvantages of vertical and horizontal cameras.

2. Show students different examples of types of camera copy and discuss how each type will reproduce if exposed as a line negative.

3. Discuss usage of different types of graphic arts camera film.

4. Give students a tour of the camera/darkroom area. Thoroughly discuss darkroom safety according to Assignment Sheet #2.

5. Review Material Safety Data Sheets (MSDS) for Hazardous material Identification System (HMIS) information and, if desired, have students label darkroom chemicals with approved HMIS label.

(NOTE: MSDS sheets with HMIS labeling information are available through your local graphic arts supplier.)

SUGGESTED ACTIVITIES

6. Demonstrate process camera set-up and operation procedure. Include making exposure, film processing, and negative evaluation.

7. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. Bentley, R.G.; J.C. Olson; C.E. Strandberg; and R.E. Wiper. *Graphic Communications Series: Transparency Originals*. Chicago, IL: A.B. Dick Company.

B. DeStree, Thomas M. *The Lithographers Manual*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1994.

C. Cogoli, John E. *Photo-Offset Fundamentals*. Old Tappan, NJ: MacMillan Publishing Company, 1986.

SUGGESTED SUPPLEMENTAL MATERIAL

Text – Cogoli, John E., *Graphic Arts Photography: Black and White*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

Audiovisual

A. No. 5070, "Introduction to the Process Camera," 35mm slides w/tape or video. Graphic Arts Technical Foundation, 4615 Forbes Avenue, Pittsburgh, PA 15213-3796.

B. No. 5071. "Line Copy for the Process Camera," 35mm slides w/tape or video. Available from GATF as indicated above.

C. No. 15 "Understanding the OSHA Hazard Communication Standard," 35mm slides w/tape or video. Available from GATF as indicated above.

Graphic Arts Technical Foundation
4615 Forbes Ave.
Pittsburgh, PA 15213
Telephone: (412) 621-6941
www.gatf.com/products.html
or
E-mail Training@gatf.lm.com

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1 — When evaluating this assignment, please use the following criteria:

Line Copy — Four different examples including typeset copy, clip art, typewritten copy, and an illustration done in a light blue pen or pencil

Halftone Copy — Two different examples including a small black-and-white photograph and a piece of art using any other media that has a good representation of black-and-white tonal value

Full Color Copy — Two different examples including a small color photograph and a piece of art using any other media that has a good range of color

Assignment Sheet #2

1. Aid in the prevention of injury and know what to do in the event an injury occurs.
2. Instructor, instructor
3. Personal protection devices
4. Store chemicals in non-breakable containers on the lowest available shelf.
5. Turned off and unplugged
6. Identify the source of irritant, obtain treatment to relieve symptoms, and use appropriate protective device(s) to avoid reoccurrence.
7. Clean it up immediately to avoid slips or falls.
8. Pour chemical into the water.
9. Put the film down and make sure hands are dry.
10. Eyewash station

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

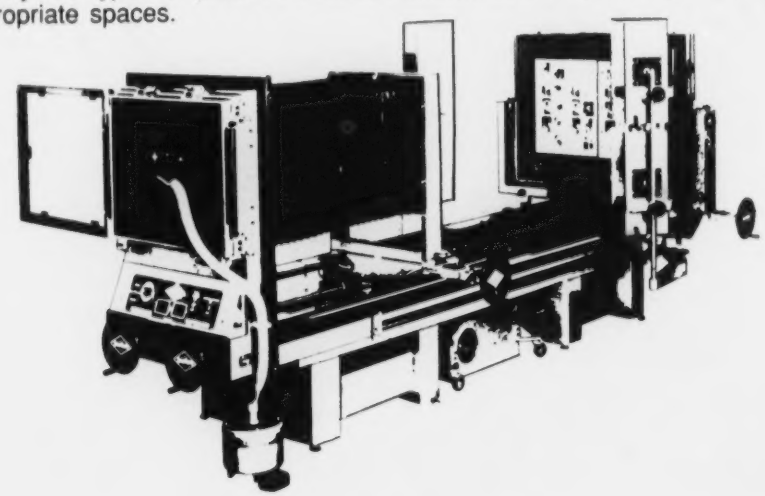
TEST

Name _____ Score _____

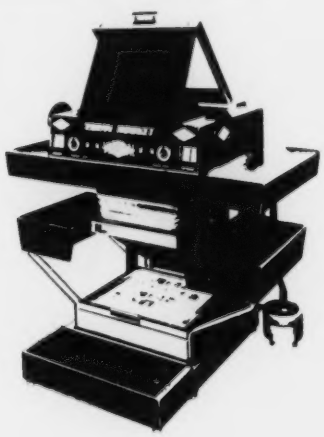
1. Define a process camera. _____

_____

2. Identify the types of process cameras shown below by writing their names in the appropriate spaces.



a. _____



b. _____

TEST

3. Identify the parts of the process cameras on the following pages by completing the blanks with the words on the right.

(NOTE: Answers may be used more than once.)

a. _____

b. _____ Camera lights

c. _____ Copyboard

d. _____ Bellows

e. _____ Film back

f. _____ Lens board

g. _____ Ground glass

h. _____ Lens board control

i. _____ Copy board control

j. _____ Vacuum pump

k. _____ Diaphragm

l. _____ Lens

m. _____ Tapes

n. _____ Timer

o. _____

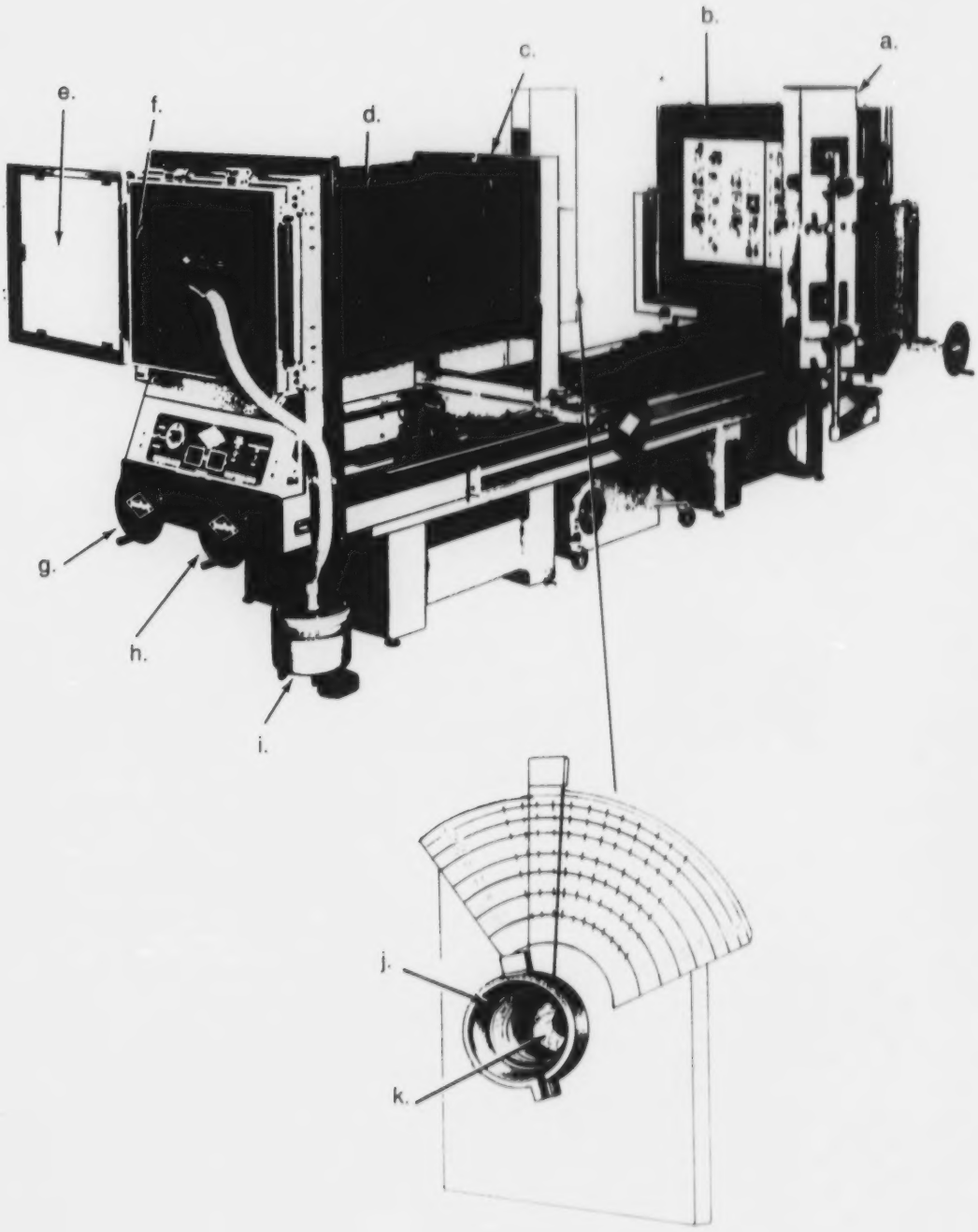
p. _____

q. _____

r. _____

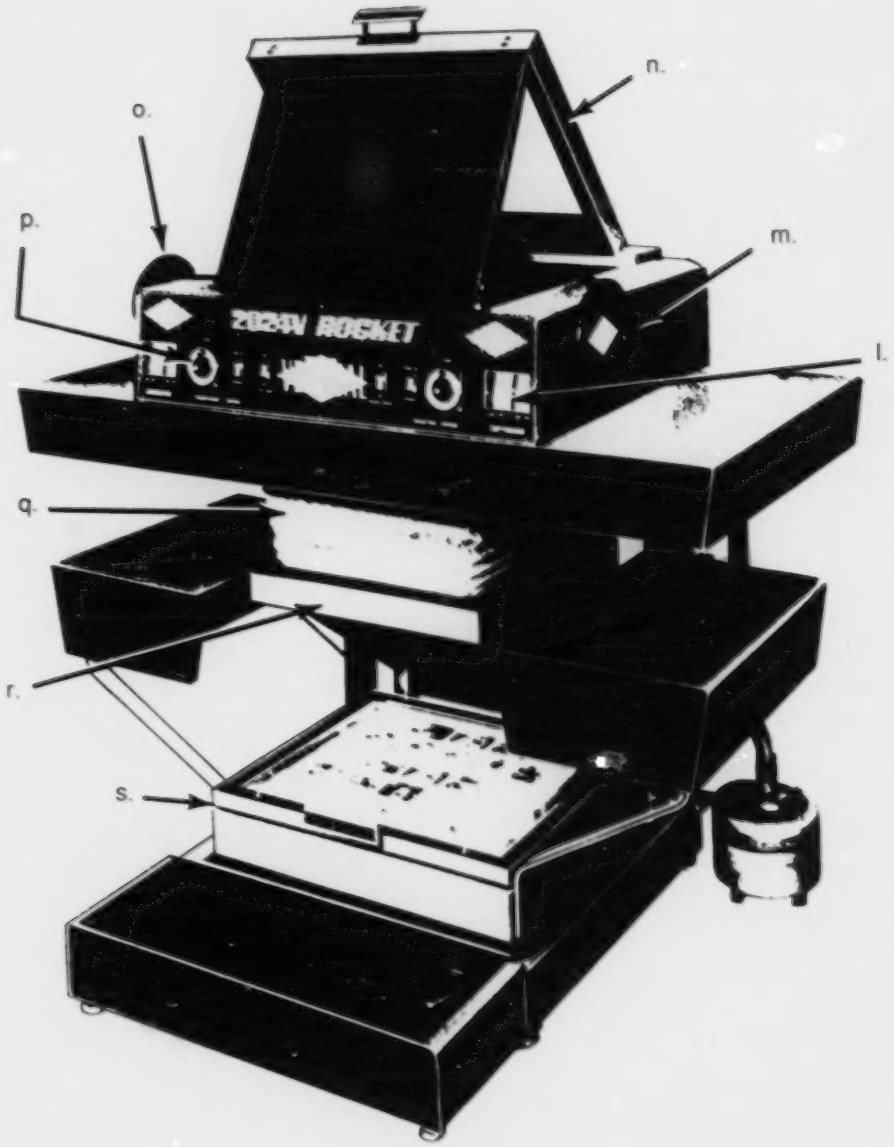
s. _____

TEST



8

TEST



TEST

4. Match the parts of a process camera on the right with their correct functions.

_____a.	A hinged gate that holds the film in place, usually by means of a vacuum	1.	Copyboard
_____b.	Attached to the copyboard and used to illuminate copy	2.	Lens board
_____c.	A crank which changes the position of the lens board for a correct size and properly focused image	3.	Ground glass
_____d.	A flat surface used to hold copy, equipped with a hinged glass cover to hold copy in place	4.	Camera lights
_____e.	Holds the lens, diaphragm, and shutter	5.	Film back
_____f.	A light-tight, accordion-like chamber between the front case and camera back	6.	Bellows
_____g.	A piece of ground or frosted glass that is positioned on the back of the camera to aid in focusing	7.	Copyboard control
_____h.	A vacuum device, with the hose attached to the camera back	8.	Lens board control
_____i.	A crank which changes the position of the copyboard for a correct size and properly focused image	9.	Tapes
_____j.	A timing device that is linked to the shutter	10.	Diaphragm
_____k.	A device that controls the duration of light striking the film	11.	Shutter
_____l.	A device that controls the quantity of light striking the film	12.	Vacuum pump
_____m.	One or more pieces of optical glass designed to collect and focus rays of light to form a sharp image on film	13.	Timer
_____n.	Two narrow strips of thin, flexible steel or plastic marked off in percentage units	14.	Lens

TEST

5. Match the three types of camera copy on the right with their correct descriptions.

_____a.	Black and white copy consisting of a single shade of black and white usually on a white background	1. Line
_____b.	Illustrative material in original hues	2. Halftone
_____c.	Black and white copy with intermediate shades of gray	3. Full color

6. Match darkroom equipment/supplies on the right with their uses.

(NOTE: Equipment/supplies and their uses continued on next page.)

_____a.	A container used for mixing and measuring chemicals	1. Darkroom timer
_____b.	A weak solution of acetic acid, used in processing black and white film or paper; it stops development, prevents stains on paper, and makes the fixer last longer	2. Graduate
_____c.	Used to indicate elapsed time during processing or to operate or control darkroom equipment	3. Thermometer
_____d.	A device used to measure the temperature of liquids	4. Paper
_____e.	An enclosed darkroom lamp fitted with a filter to screen out light rays to which film and paper are sensitive	5. Camera film
_____f.	A photosensitive material consisting of a light sensitive emulsion, clear base material, and an antihalation coating	6. Developer
_____g.	A sensitized material with opaque base used for reproduction processes	7. Stop bath
_____h.	A solution used to turn the latent image into a visible image on exposed films or photographic paper	8. Fixer
_____i.	A solution that removes any light-sensitive material not acted upon by light or developer, leaving a black and white negative or print that can no longer be affected by action of light	9. Safelight

TEST

_____j. A source of running water with a built-in unit that cools or heats the water to desired temperature

_____k. Used to make same size reproduction from a negative or any other transparent or translucent material

_____l. An instrument that supplies heat and air to speed drying time on films and papers

_____m. Method of providing entrance and exit from a darkroom without allowing light to enter the darkroom; the most common type is the revolving door

_____n. A device used to cut or trim large sheets of film or paper to desired size

_____o. Mechanical device for automatic processing of film using a developer, fixer, wash and dryer

_____p. A water-tight light table equipped with ortho safe and white light; may be used for film inspection during processing with ortho, or after processing with white light

_____q. A device that contains an activator and is used primarily for processing diffusion transfer materials

_____r. Hand method of processing film using 3 trays and a running water bath; the trays contain developer, stop bath, and fixer

10. Film dryer
11. Diffusion transfer processor
12. Light trap
13. Viewing table
14. Film cutter
15. Temperature control sink
16. Contact printing frame
17. Tray processing
18. Automatic film processing

7. Match the types of camera (graphic arts) film on the right with their physical characteristics.

(NOTE: Some characteristics apply to both types of film.)

_____a. Base material

_____b. Antihalation coating

_____c. Emulsion

_____d. Narrow exposure latitude

1. Rapid access
2. Lith

TEST

_____e. Precise control required for development

_____f. Fastest system for producing negatives

_____g. High degree of latitude in processing

_____h. Requires a single step developer

_____i. Requires two part developer

8. Select true statements concerning darkroom cleanliness by placing an "X" in the blanks preceding the true statements.

_____a. Mop floors frequently.

_____b. Clean up spilled chemicals once a day.

_____c. Store equipment on the floor.

_____d. Keep all work surfaces clean.

9. Select true statements concerning darkroom safety by placing an "X" in the blanks preceding the true statements.

_____a. Know storage locations so that chemicals can be mixed under darkroom safelight conditions.

_____b. When mixing chemicals always pour water into chemical.

_____c. A person should always wash their hands after coming into contact with darkroom chemicals.

_____d. Glass containers are preferable to plastic or steel for storing darkroom chemicals.

_____e. Clean up any moisture on the floor or working surfaces immediately.

_____f. Suggested personal protective devices for mixing chemicals would include goggles, rubber gloves, and an apron.

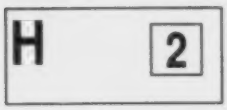
_____g. Never handle electrical equipment with wet hands or when standing on a wet floor.

_____h. Have an eyewash station conveniently located in the darkroom in the event chemicals accidentally get splashed into the eyes.

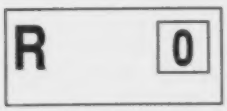
TEST

10. Interpret Hazardous Materials Identification System (HMIS) labels below by giving a brief interpretation for each label. Include the color designation for each label in your answers.

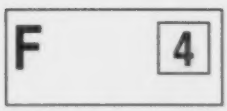
a.



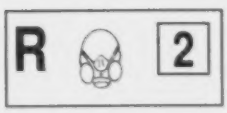
b.



c.



d.



*Permission to duplicate this test is granted.

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

ANSWERS TO TEST

1. A large, sturdy camera used for photographing flat surfaces

2. a. Horizontal
   b. Vertical

3. a. Camera lights
   b. Copyboard
   c. Lens board
   d. Bellows
   e. Ground glass
   f. Film back
   g. Lens board control
   h. Copyboard control
   i. Vacuum pump
   j. Lens
   k. Diaphragm
   l. Tapes
   m. Lens board control
   n. Ground glass
   o. Copyboard control
   p. Timer
   q. Bellows
   r. Lens board
   s. Copyboard

4. a. 5
   b. 4
   c. 8
   d. 1
   e. 2
   f. 6
   g. 3
   h. 12
   i. 7
   j. 13
   k. 11
   l. 10
   m. 14
   n. 9

5. a. 1
   b. 3
   c. 2

6. a. 2
   b. 7
   c. 1
   d. 3
   e. 9
   f. 5
   g. 4
   h. 6
   i. 8
   j. 15
   k. 16
   l. 10
   m. 12
   n. 14
   o. 18
   p. 13
   q. 11
   r. 17

7. a. 1,2
   b. 1,2
   c. 1,2
   d. 2
   e. 2
   f. 1
   g. 1
   h. 1
   i. 2

8. a,d

9. c,e,f,g,h

ANSWERS TO TEST

10. a. Chemical is a moderate health hazard; color designation is blue.
    b. Chemical is stable; a reactivity hazard; color designation is yellow.
    c. Chemical is extremely flammable; color designation is red
    d. Violent chemical change may occur; color designation is yellow; respirator should be worn when working with chemical

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Assignment Sheet Ratings

Assignment Sheet #1—Collect Types of Copy Rating _____

Comments: _____

_____

Assignment Sheet #2—Complete a Darkroom Safety Worksheet Rating _____

Comments: _____

_____

Job Sheet Rating

Job Sheet #1—Prepare a Darkroom for Tray Processing, and Expose and Develop a Line Negative Rating _____

Comments: _____

_____

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

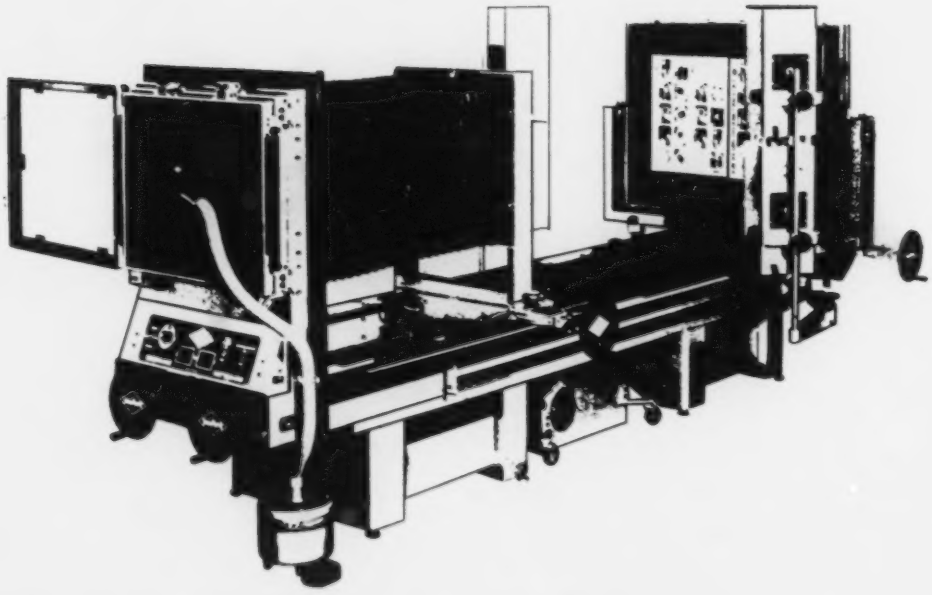
_____

Teacher Signature _____ Date _____

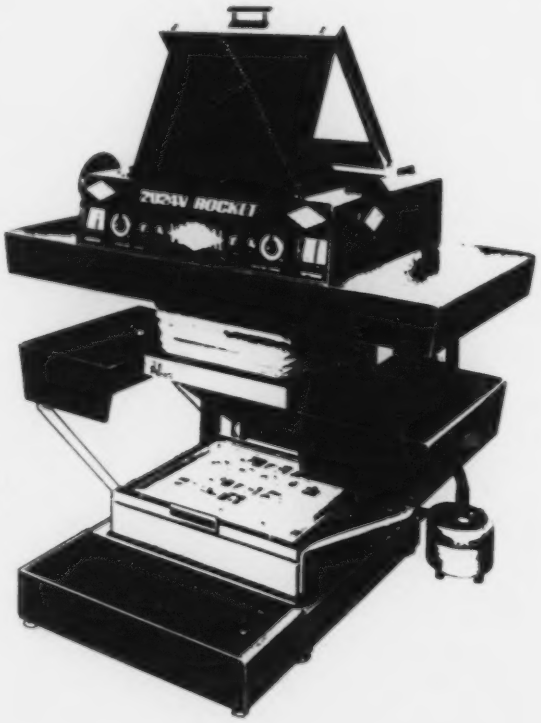
Student Signature _____ Date _____

*Permission to duplicate this form is granted.

Types of Process Cameras

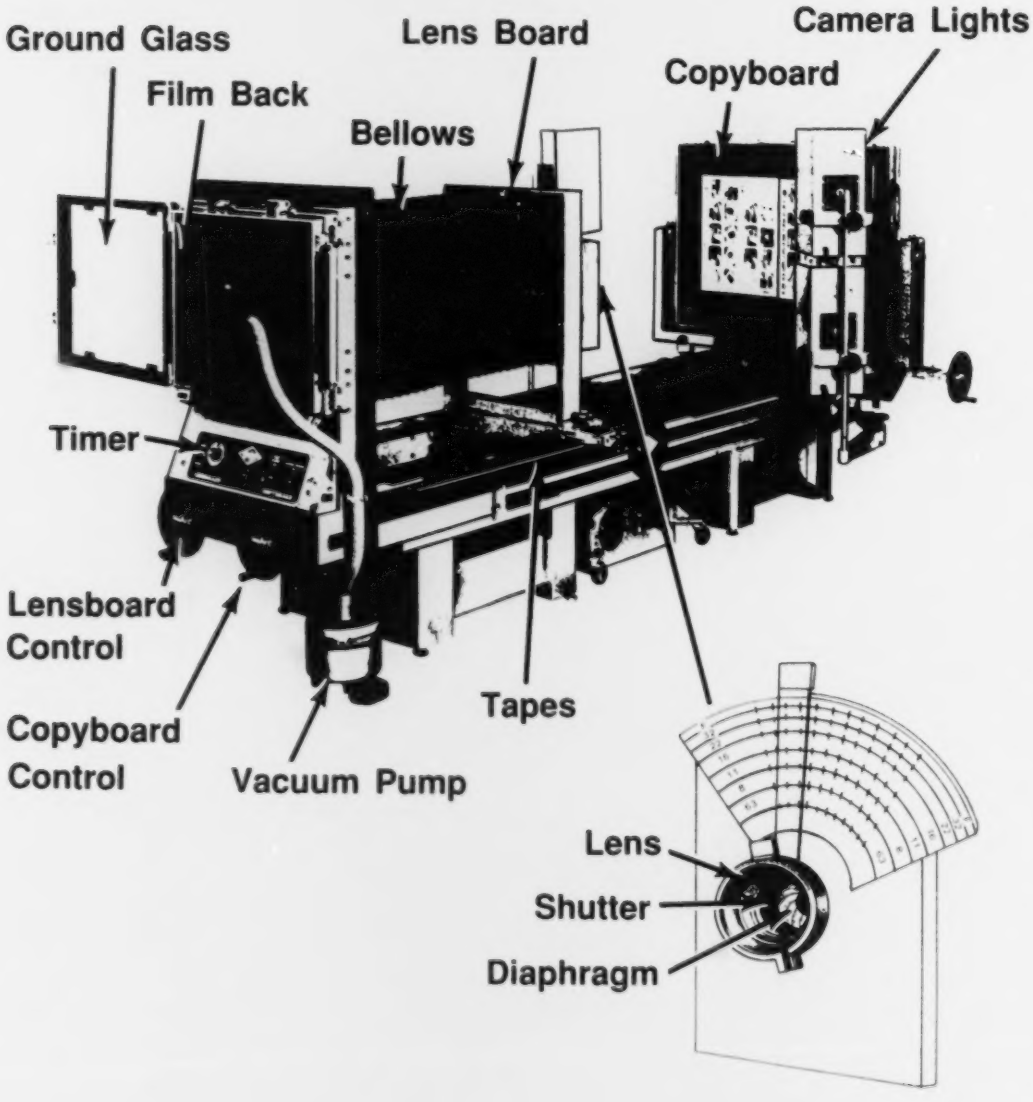


Horizontal Camera



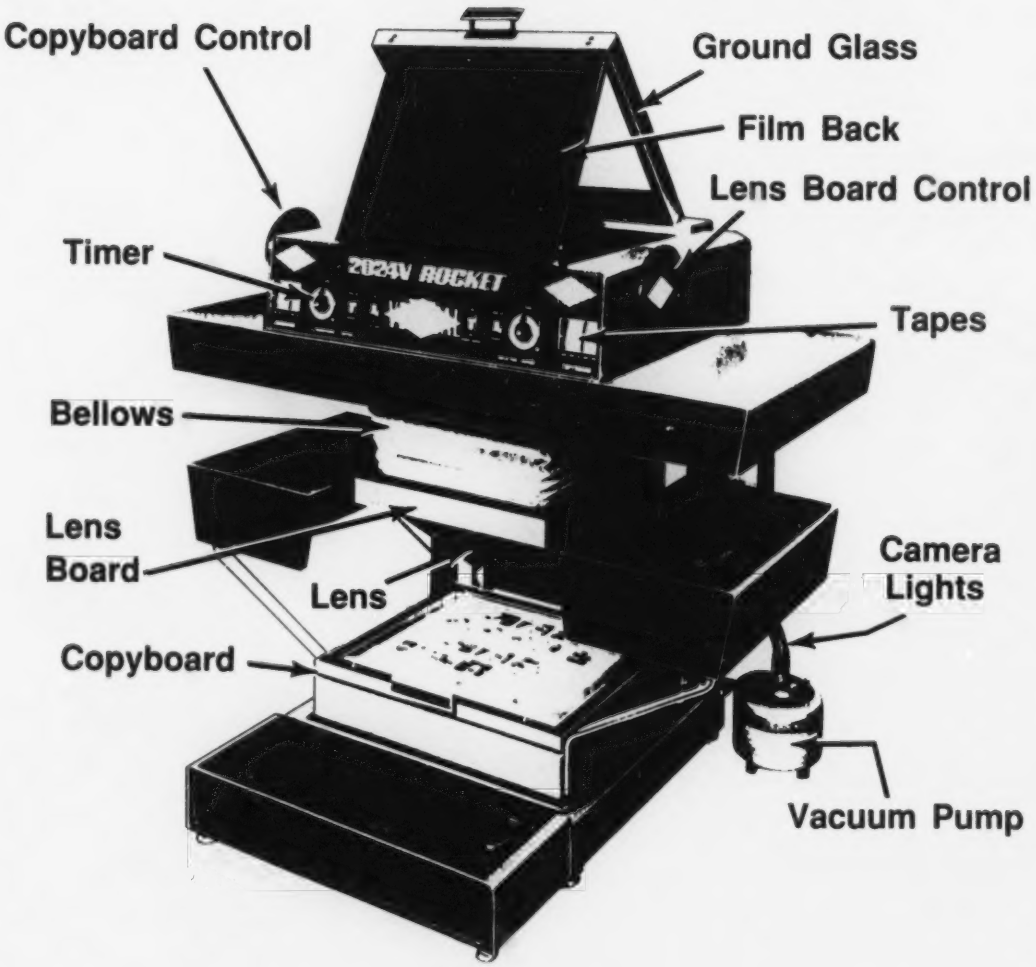
Vertical Camera

Parts of a Process Camera



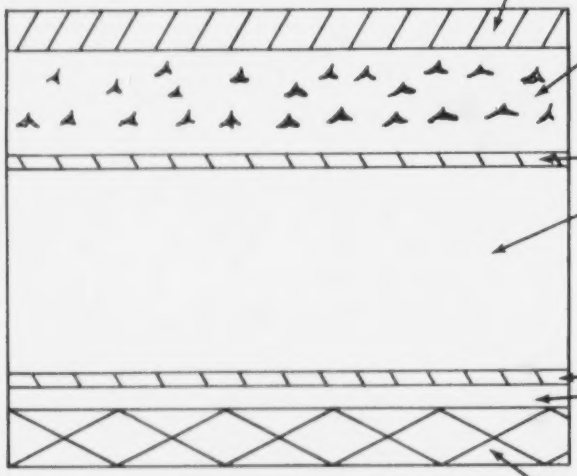
Horizontal Process Camera

Parts of a Process Camera
(Continued)



Vertical Process Camera

Schematic Cross-Section of Graphic Arts Camera Film



Protective Overcoat — Reduces scratches during handling and processing

Emulsion — Light sensitive part of film

Adhesive Subcoat — Used to adhere emulsion to the base

Base — Main support which gives film strength. Base material gives 70-85% of total film thickness

Adhesive Subcoat — Same as above

Anti-Stat Layer — Minimizes static on film thereby reducing dust on film surface

Antihalation Backing — Prevents unwanted light from bouncing back through emulsion and causing a blurred image

(NOTE: Illustration above applies to both lith and rapid access types of camera film.)

Hazardous Material Identification Labeling System (HMIS)

The illustration below shows typical examples of labels used for graphic arts chemicals and solvents. In addition to identifying the level of concern for health, flammability and reactivity, please note all labels carry a symbol for personal protection recommended for personal safety when handling the particular product.

Some manufacturers use a simple black and white label as shown below. Other manufacturers choose to use a label with color coding.

0 - Minimal 1 - Slight 2 - Moderate 3 - Serious 4 - Severe		Color Coding
H Health	0	Blue
F Flammability	1	Red
R Reactivity	0	Yellow
Personal Protection		

LINE PHOTOGRAPHY
UNIT II

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit. Distribute photocopies of TM 1-2 to students for parts identification of a typical lens assembly.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives. Be certain to note equipment and processing in this unit are rapidly being digitized and relegated to computer tasks. See Unit 8.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparencies to enhance the information as needed.)

G. Provide students with job sheet.

H. Discuss and demonstrate the procedures outlined in the job sheet. Use the job sheet to illustrate use of filters, reductions, enlargements, and problem copy.

I. Integrate the following activities throughout the teaching of this unit:

1. Provide students with problems to help them correctly identify various types of copy and how to determine appropriate exposure for each type.

2. Provide students with problems dealing with enlargement and reduction.

3. Have students review Unit 1 to prepare a darkroom for tray processing (if needed).

4. Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

SUGGESTED ACTIVITIES

REFERENCES USED IN WRITING THIS UNIT

A. DeStree, Thomas M. *The Lithographer's Manual.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1994.

B. Cogoli, John E. *Photo-Offset Fundamentals.* Old Tappan, NJ: MacMillan Publishing Co., 1986.

C. Koonce, John W. *Graphic Arts Photography: An Individualized Approach.* Emporia, KS: Emporia State University Press.

SUGGESTED SUPPLEMENTAL MATERIAL

Text – Cogoli, John E. *Graphic Arts Photography: Black and White.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

Slide or video presentation – *Process Camera Exposure Determination.* (5073)

Available from:

Education Council of the Graphic Arts Industry
Graphic Arts Technical Foundation
4615 Forbes Avenue
Pittsburgh, PA 15213-3796
www.gatf.com/products.html
or
E-mail Training@gatf.lm.com

LINE PHOTOGRAPHY
UNIT II

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

A. 6, 8, 12, 16, 24, 32, 48, 64

B. 7.5, 10, 15, 20, 30, 40, 60, 80

LINE PHOTOGRAPHY
UNIT II

TEST

Name _____ Score _____

1. Match the terms on the right with their correct definitions.

_____a.	Any image composed of solid dark areas against a white background	1. Density
_____b.	Electromagnetic radiation having different wave lengths that produce different colors, such as red, green and blue	2. Emulsion
_____c.	Copy with a good dense black image and a white background	3. Reflection gray scale
_____d.	Lightness or darkness of a particular piece of copy	4. Filter
_____e.	Commercially produced strip of photographic paper stepped in increasing density values of .15 for each step	5. Line copy
_____f.	Instrument for reading photographic densities	6. Unusual copy
_____g.	Ability of a lens or film emulsion to record fine detail	7. Resolving power
_____h.	Light-sensitive coating on photographic materials	8. Photo factor
_____i.	States that every exposure increase of .30 density requires a 2X exposure factor	9. Densitometer
_____j.	Copy where the background and/or image is in a color other than black	10. Filter factor
_____k.	Colored device made commonly of gelatin or glass; placed in front of the lens to reduce or eliminate light of certain colors and allow the light of other colors to pass through onto the film for exposure	11. Color copy
		12. White light
		13. *F*/stop
		14. Running water bath
		15. Normal copy

TEST

_____l. A number multiplied by the normal exposure to achieve the necessary exposure increase when using a filter

_____m. The diameter of the lens opening

_____n. Removes residual effects of film processing chemicals; makes the film more permanent

_____o. Copy that fits either extreme; extra heavy, light or extra light

2. Complete the following statements concerning principles of line photography by writing in the necessary word or words.

   a. Light rays travel in a _____ line as they are projected through the lens of a camera.

   b. An image must be placed in the copyboard _____ in order to be viewed right reading from the ground glass.

   c. When camera lights illuminate the copy in the copyboard, light copy areas _____ light and dark copy areas absorb light.

   d. The reflected portion of the light passes through the lens and exposes the emulsion of the film creating a _____.

   e. The _____ copy area does not record an exposure on the film, thus the clear image area shows up on the developed film.

3. Distinguish between types of film base material by writing the correct numbers in the blanks.

_____a.	Plastic or acetate	1.	Non-stable base
_____b.	Polyester	2.	Dimensionally stable base
_____c.	Used for most line work		
_____d.	Used for work that requires precise image stability		

4. Differentiate among types of emulsion by writing the correct numbers in the blanks.

_____a.	Film sees all colors except red	1.	Panchromatic
_____b.	Film sees all colors to include red	2.	Orthochromatic
_____c.	Film sees only blue	3.	Blue-sensitive

TEST

5. Describe the following degrees of density.

   a. Opaque _____

   b. Translucent _____

   c. Transparent _____

6. State an exposure rule for recording density steps on a gray scale.

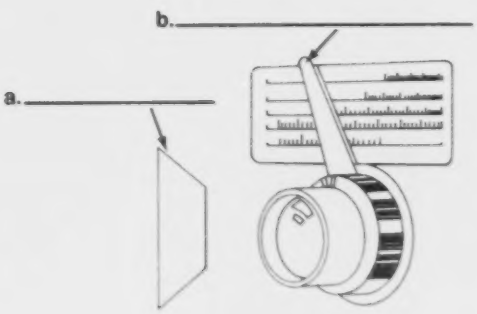
   _____

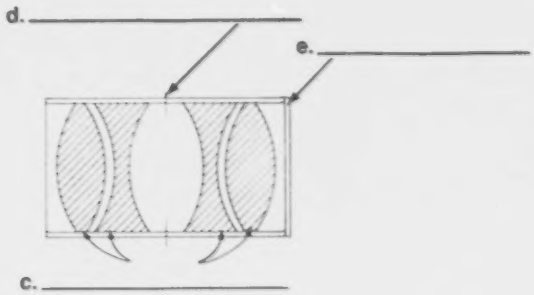
   _____

   _____

   _____

7. Identify the parts of a typical lens assembly by writing the correct names in the blanks in the following illustrations.





TEST

8. Select true statements concerning the characteristics of an aperture by placing an "X" in the appropriate blanks.

   _____a. The aperture is located inside lens barrel.

   _____b. The aperture is made up of several metal blades that form a circular opening.

   _____c. A change in an *f*/stop number will not affect the aperture.

   _____d. A change in an *f*/stop number will change the aperture.

   _____e. The aperture does not affect the quantity of light striking the film.

9. Select true statements concerning the functions of filters by placing an "X" in the appropriate blanks.

   _____a. Filters are used to drop color and therefore photograph as black.

   _____b. Filters are used to hold color and therefore photograph as white.

   _____c. Filters are used to drop color and therefore photograph as white.

   _____d. Filters are used to hold color and therefore photograph as black.

*Permission to duplicate this test is granted.

LINE PHOTOGRAPHY
UNIT II

ANSWERS TO TEST

1.

a.	5	f.	9	k.	4
b.	12	g.	7	l.	10
c.	15	h.	2	m.	13
d.	1	i.	8	n.	14
e.	3	j.	11	o.	6

2.
a. Straight
b. Upside down
c. Reflect
d. Latent image
e. Dark

3.
a. 1
b. 2
c. 1
d. 2

4.
a. 2
b. 1
c. 3

5.
a. Blocks out all light
b. Blocks out only a portion of the light
c. Allows almost all light to pass through

6. Every change in density of .30 requires either twice or half as much exposure.

7.
a. Lens shade and filter holder
b. *F*/stop adjustment lever
c. Lens elements
d. Aperture
e. Shutter
f. Electric solenoid

8. a, b, d

9. c, d

LINE PHOTOGRAPHY
UNIT II

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Assignment Sheet Rating

Assignment Sheet #1—Apply an Exposure Rule for Different Steps on the Gray Scale Rating _____

Comments: _____

_____

Job Sheet Rating

Job Sheet #1—Set Up a Process Camera and Determine Exposures Rating _____

Comments: _____

_____

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

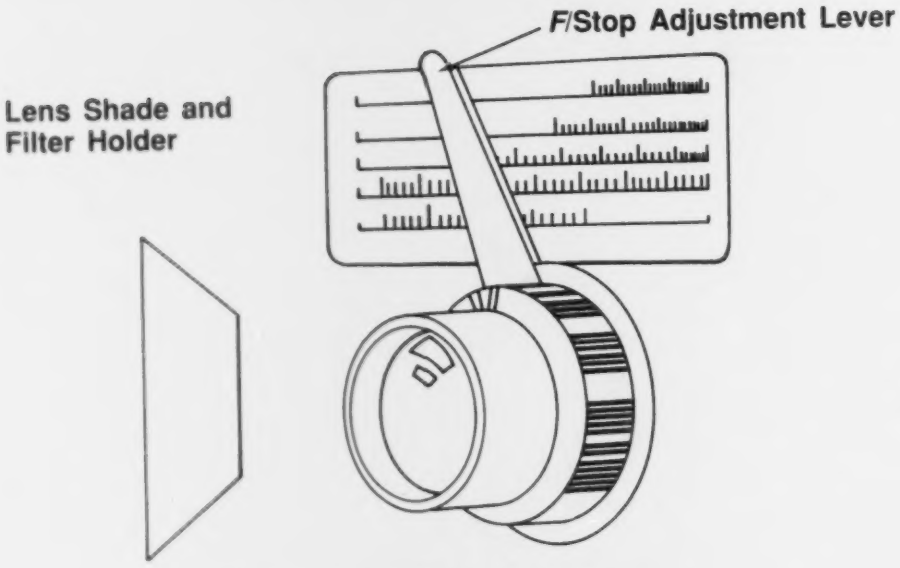
_____

Teacher Signature _____ Date _____

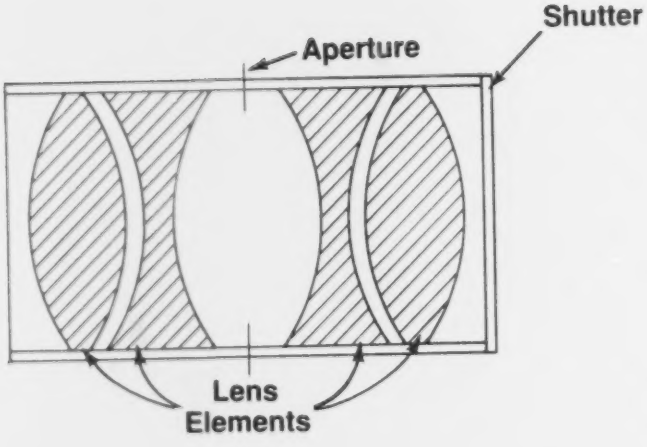
Student Signature _____ Date _____

*Permission to duplicate this form is granted.

Parts of a Typical Lens Assembly

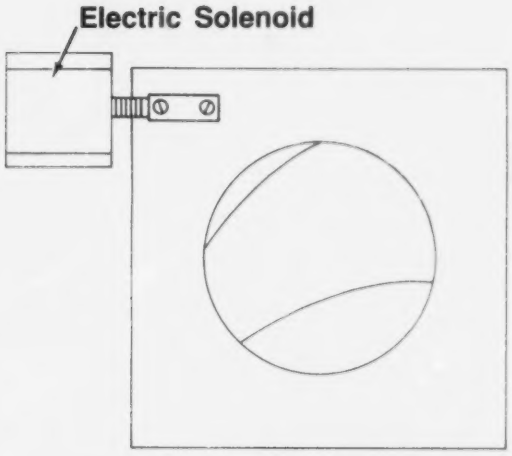


View from Front of Camera

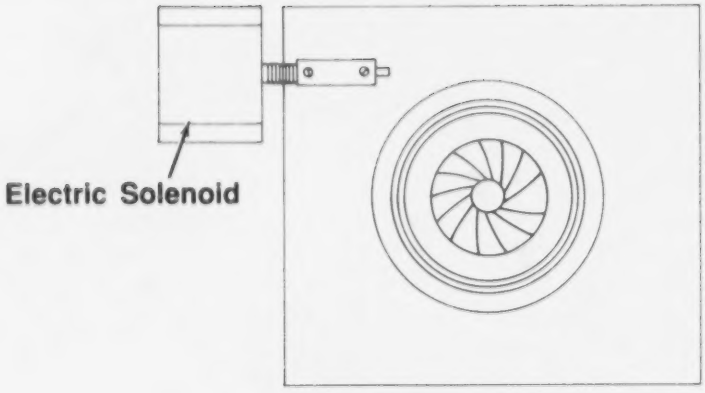


Schematic Cross Section of a Typical Process Lens

Parts of a Typical Lens Assembly (Continued)



Shutter Mechanism Closed



Shutter Mechanism Open

View from Inside Camera

HALFTONE PHOTOGRAPHY
UNIT III

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make a transparency from the transparency master included with this unit. Distribute photocopies of TM 1 concerning contact screen exposure to students.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives. Note the rapid move to computer-to-plate technology and what it means to graphic arts professionals.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparency to enhance the information as needed.)

G. Provide students with job sheets. Be certain to note equipment and processes in this unit are rapidly being digitized and relegated to computer tasks. These activities remain in this unit because numerous school programs and print shops throughout the nation still use this technology. See Unit 8.

H. Discuss and demonstrate the procedures outlined in the job sheets.

I. Integrate the following activities throughout the teaching of this unit:

1. Through outside sources of printed examples such as newspapers and magazines, have students collect examples of good quality and poor quality halftones. Discuss them in class and make students aware of criteria for quality halftone reproduction.

2. Utilize available resources to make students aware of computerized halftone exposure systems; i.e., Carlson Sharpshooter, Kodak Q700, Macbeth exposure controller, Gamm System, etc.

3. Although this unit of instruction deals with the production of halftone negatives, make students aware of halftone procedures using diffusion transfer procedures.

4. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

SUGGESTED ACTIVITIES

K. Evaluate test.

L. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. DeStree, Thomas M. *The Lithographer's Manual.* Pittsburgh, PA: Graphic Arts Technical Foundation , 1994.

B. Cogoli, John E. *Photo-Offset Fundamentals.* Old Tappan, NJ: MacMillan Publishing Company, 1986.

C. Koonce, John W. *Graphic Arts Photography: An Individualized Approach.* Emporia, KS: Emporia State University Press.

SUGGESTED SUPPLEMENTAL MATERIAL

A. Texts

1. Cogoli, John E., *Graphic Arts Photography: Black and White.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

2. *The Contact Screen Story.* Wilmington, DE: E. I. DuPont and Company, Inc., Photo Products Division.

3. Hope, Clerance, *Halftone Photography 1.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

B. Audio-visual presentations

1. *Introduction to the Halftone Process* (5075).

2. *Making Halftones with the Contact Screen* (5076).

The audio-visual presentations listed above are available from:

Graphic Arts Technical Foundation
4615 Forbes Avenue
Pittsburgh, PA 15213-3796
www.gatf.com/products.html
or
E-mail Training@gatf.lm.com

HALFTONE PHOTOGRAPHY
UNIT III

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

The student should circle three areas: 10 percent highlight dot, 50 percent middletone dot, and 90 percent shadow dot. They should be correctly labeled in the margin.

HALFTONE PHOTOGRAPHY
UNIT III

TEST

Name_____ Score _____

1. Match the terms on the right with their correct definitions.

_____a.	A converted image of a continuous tone copy that consists of solid dots of equal density but varying sizes	1. No-screen exposure
_____b.	Used in the light path between the lens and film to break the continuous tone copy into a dot pattern for reproduction	2. Halftone screen
_____c.	A precision pattern of vignetted dots on a flexible base material used in direct contact with the film	3. Density
_____d.	The number of lines per inch on a halftone screen	4. Rescreening
_____e.	A numerical measure of the blackening or light-stopping ability of a photographic image	5. Duotone
_____f.	An instrument for making density measurements	6. Halftone
_____g.	A detail exposure made through the lens of the camera, with the contact screen in place with only the camera lights	7. Flash exposure
_____h.	A nonimage exposure made through the contact screen to the film; used to increase dot size in the shadow area of the halftone	8. Neutral density filter
_____i.	An exposure made by exposing the film to the copy without the contact screen	9. Fake duotone
_____j.	A gray-colored filter used to uniformly reduce all colors of light	10. Contact screen
_____k.	A two-impression reproduction using two halftones of the same original	11. Densitometer
_____l.	A two-impression reproduction, with a halftone which is overprinted on a color block	12. Moire
		13. Screen ruling
		14. Main exposure
		15. Halftone dot

TEST

_____m. An individual dot of printed ink; groups of dots represent percentage of ink coverage on the printed sheet

_____n. An objectionable wavy effect produced when screens are overprinted at an incorrect angle

_____o. Screening of a printed halftone illustration

2. Match the types of contact screens on the right with the correct descriptions.

_____a. A dyed screen whose tone reproduction characteristics can be altered with the use of magenta and yellow filters

_____b. A screen that produces square middletone dots that join all four corners as the dots reach 50 percent

_____c. A screen that produces football-shaped middletone dots that join only two opposite corners as the dots reach 50 percent

_____d. A silver emulsion screen that does not require magenta color for control of tone reproduction

1. Elliptical dot screen
2. Magenta contact screen
3. Gray contact screen
4. Conventional dot screen

3. Select true statements concerning the care of contact screens by placing an "X" in the appropriate blanks.

_____a. Clean water spots only with blanket wash.

_____b. Dust the screen by wiping it with a clean shop towel.

_____c. Keep the screen flat and in its original folder when not in use.

_____d. Protect from dirt, dust, fingerprints, scratches, and other damage.

4. Complete the following statements concerning dot percentages by writing the correct words in the blanks.

a. Halftone dots are described in terms of _____ of ink coverage on the printed page.

b. Dot percentages as they appear on the printed page are exactly opposite of how they appear on the _____.

TEST

c. The highlight area of a halftone typically prints 10 percent ink coverage with 90 percent white _____from the page, thus the eye sees primarily white.

d. The _____ areas appear to be gray because the 50 percent ink coverage and 50 percent white reflected from the page are blended by the eye.

e. The shadow area of a halftone typically prints 90 percent ink coverage with only 10 percent white reflected from the page, thus the eye sees primarily _____ in the shadow area of a printed halftone.

5. Select true statements concerning procedures for avoiding moires in rescreening by placing an "X" in the appropriate blanks.

_____a. Use a screen which has a screen ruling that is the same as the copy.

_____b. The original may be greatly enlarged.

_____c. Hold a clean piece of glass in front of the lens, and tilt back and forth during exposure.

_____d. Angle the contact screen or copy 30 degrees.

_____e. Halftone dots may be thrown out of focus slightly.

* Permission to duplicate this test is granted.

HALFTONE PHOTOGRAPHY
UNIT III

ANSWERS TO TEST

1.

a.	6	f.	11	k.	5
b.	2	g.	14	l.	9
c.	10	h.	7	m.	15
d.	13	i.	1	n.	12
e.	3	j.	8	o.	4

2.

a.	2	c.	1
b.	4	d.	3

3. c, d

4.
a. Percentage
b. Halftone negative
c. Reflected
d. Middletone
e. Black

5. c, d, e

HALFTONE PHOTOGRAPHY
UNIT III

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Assignment Sheet Rating

Assignment Sheet #1—Identify Halftone Dot Percentages Rating _____

Comments: _____

_____

Job Sheet Ratings

Job Sheet #1—Program a Q15 Exposure Computer
and Make a Halftone Negative Rating _____

Comments: _____

_____

Job Sheet #2--Make a Duotone Rating _____

Comments: _____

_____

Job Sheet #3--Make a Fake Duotone Rating _____

Comments: _____

_____

Job Sheet #4--Rescreen a Halftone Illustration Rating _____

Comments: _____

_____

UNIT EVALUATION FORM

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

_____

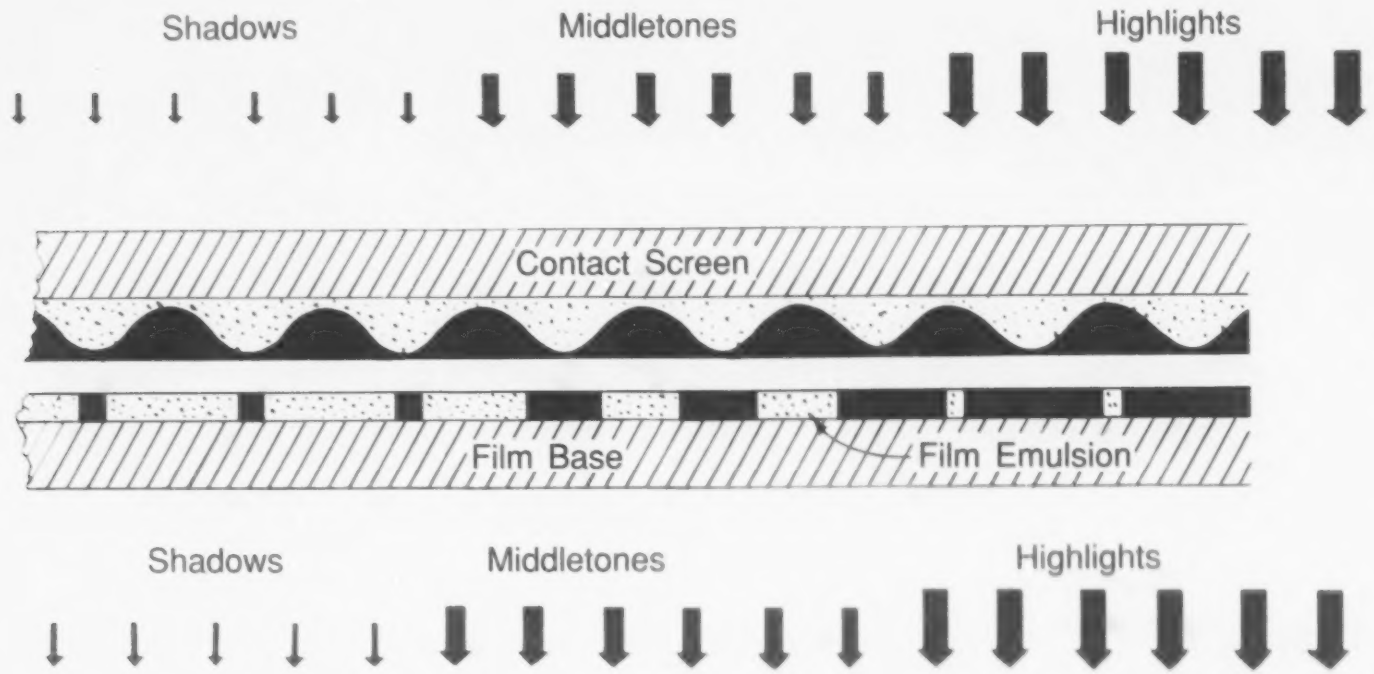
Teacher Signature _____ Date_____

Student Signature _____ Date_____

*Permission to duplicate this form is granted.

Contact Screen Exposure

Light striking film through a contact screen must penetrate varying density in the form of a dot pattern on the screen in order to reach and expose the film. Intense light from highlight areas in the original penetrates even dense areas on the screen and exposes a large dot pattern on the film. The slight amount of light coming from dark areas, on the other hand, yields only small dots.



TM 1

GII-T57

OTHER DARKROOM TECHNIQUES
UNIT IV

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

(NOTE: Many school shops are no longer equipped with diffusion transfer processors. This material may not be applicable to those programs. To others, however, the activities will provide excellent hands-on training in darkroom technique.)

C. Provide students with information sheet.

D. Discuss information sheet. Be certain to note these activities are rapidly being digitized and relegated to computer tasks. See Unit 8.

E. Provide students with job sheets.

F. Discuss and demonstrate the procedures outlined in the job sheets.

G. Integrate the following activities throughout the teaching of this unit:

1. Demonstrate procedures for making a step-off test to determine a basic exposure when using the contact frame/platemaker.

2. If possible, demonstrate to the students both darkroom films and paper, and roomlight films and paper when used in a contact environment.

3. Give students exposure to as many different diffusion transfer products as possible, i.e., image reversal material, receiver film and plate material.

4. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

H. Give test.

I. Evaluate test.

J. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. Cozart, Jerome X. *Basic Film Contacting.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

B. Cozart, Jerome X. *Contacting (Spreads & Chokes).* Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

C. Knittel, Patricia A. *Creating Special Effects with Posterization.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

D. Schneider, Robert J. *Diffusion Transfer.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

SUGGESTED SUPPLEMENTAL MATERIAL

Text – *The ByChrome Idea Book.*

Available from:

ByChrome Company
Box 1077
Columbus, OH 43216

OTHER DARKROOM TECHNIQUES
UNIT IV

TEST

Name _____ Score _____

1. Match terms on the right with the correct definitions.

_____a.	A photographic process characterized by exposing a sheet of sensitized paper, processing the paper in contact with a receiver sheet, and peeling the two apart after a short waiting period to produce a usable image on the receiver	1. Diffusion transfer receiver paper
_____b.	Trade name of diffusion transfer material marketed by the Eastman Kodak Company	2. Choke
_____c.	A light-sensitive camera speed paper designed for use in a process camera	3. Duplicating film
_____d.	A non-light-sensitive, but chemically sensitive paper that accepts the transferred image as a positive print	4. Diffusion transfer
_____e.	A non-light-sensitive, but chemically sensitive material with a transparent base	5. PMT
_____f.	A one-step, ready-to-use processing chemical used in a diffusion transfer processor	6. Contact film
_____g.	Making a line negative of a screened halftone illustration	7. Spread
_____h.	The practice of compressing a full range of tones in a picture into a few flat tones	8. Combination print
_____i.	A contact speed, thin base film used to make duplicates of an original negative or positive	9. Copy dot
_____j.	A contact speed, thin base film used to make film positive from a film negative	10. Diffusion transfer negative paper
_____k.	A contact process used for making line images fatter	11. Two-tone posterization

TEST

_____l. A contact process used for making line images thinner

_____m. A screen used to generate different patterns or textures within the photo reproduction

_____n. Material used to provide a color proof

_____o. Posterization made using three film negatives, each one made at a different exposure

_____p. A halftone combined with reverse lettering

_____q. Tones of a photograph are reduced to a black and white illustration

_____r. Tones of photograph are reproduced as black and white with screened middle-tone area

12. Diffusion transfer transparent receiver sheet

13. Posterizing

14. Activator

15. Three-color posterization

16. Color key proofing material

17. Special effects screen

18. Three-tone posterization

2. Select true statements concerning the care of a diffusion transfer processor by placing an "X" in the appropriate blanks.

_____a. Clean processor once a month.

_____b. Remove and wash the tray with warm water.

_____c. Clean the processor rollers.

_____d. Dry and reassemble the processor.

_____e. Drain and discard activator daily.

3. List the materials and equipment necessary to make a diffusion transfer print.

a. _____

b. _____

c. _____

d. _____

e. _____

*Permission to duplicate this test is granted.

OTHER DARKROOM TECHNIQUES
UNIT IV

ANSWERS TO TEST

1.

a.	4	g.	9	m.	17
b.	5	h.	13	n.	16
c.	10	i.	3	o.	15
d.	1	j.	6	p.	8
e.	12	k.	7	q.	11
f.	14	l.	2	r.	18

2. b, c, d

3.
   a. Diffusion transfer negative paper
   b. Diffusion transfer receiver paper
   c. Activator
   d. Camera
   e. Processor

OTHER DARKROOM TECHNIQUES
UNIT IV

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Job Sheet Ratings

Job Sheet #1—Determine Basic Exposure and Make a Diffusion Transfer Line Print Rating _____

Comments:

_____

_____

Job Sheet #2--Program a Q15 Exposure Computer and Make a Diffusion Transfer Halftone Print Rating _____

Comments: _____

_____

Job Sheet #3--Make a Two-Tone Posterization Using Diffusion Transfer Material Rating _____

Comments: _____

_____

Job Sheet #4--Make a Three-Tone Posterization Using Special Effects Screen and Diffusion Transfer Material Rating _____

Comments: _____

_____

UNIT EVALUATION FORM

Job Sheet #5--Make a Three-Color Posterization Using Graphic Arts Film Rating _____

Comments: _____

_____

Job Sheet #6--Make a Duplicate Negative and a Film Positive Using Graphic Arts Film Rating _____

Comments: _____

_____

Job Sheet #7--Make a Spread and Choke Using Graphic Arts Film Rating _____

Comments: _____

_____

Job Sheet #8--Make a Combination Print with Reversed Type Overprinted in a Second Color Rating _____

Comments: _____

_____

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

_____

Teacher Signature _____ Date _____

Student Signature _____ Date_____

*Permission to duplicate this form is granted.

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information sheet/and Student Supplement #1.

E. Discuss information sheet.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

1. Visit a local printing facility that is involved in four-color reproduction.

2. Make sure students develop an understanding of the differences between a typical printing operation that purchases separations for printing and a trade shop which specializes primarily in making only the separation negatives for the printing process.

3. Work with the students on exposure ratios; i.e., if a trial exposure for cyan is 30 seconds and a trial exposure for magenta is 70 seconds, assume that after making a cyan separation the correct exposure was 40 seconds, the following ratio may be used to determine the actual magenta exposure.

$$\frac{\text{original cyan}}{\text{original magenta}} \times \frac{\text{new cyan}}{\text{unknown magenta}}$$

Substitute exposure numbers for the words as given in the basic formula.

The formula would now look like the following.

$$\frac{30 \text{ seconds}}{70 \text{ seconds}} \times \frac{40 \text{ seconds}}{X}$$

The X factor represents the new unknown magenta exposure.

Cross multiply.

$30X = 2800$

SUGGESTED ACTIVITIES

X = 93⅓ seconds

The new magenta exposure would then be 93⅓ seconds.

Other exposures may be determined in like manner by comparing the cyan exposure to the yellow and black accordingly.

Note that due to differences in cameras, lighting systems, etc., an exposure device such as the Kodak direct screen calculator will be needed to fine tune the exposure system.

4. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. Eastman Kodak. *Basic Color for the Graphic Arts.* Rochester, NY: Eastman Kodak., 1986.

B. Eastman Kodak. *Direct Screen Calculator Q-10B.* Rochester, NY: Eastman Kodak Co., 1975.

C. Graphic Arts Technical Foundation. *Color and its Reproduction.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

TEST

Name _____ Score _____

1. Match the terms on the right with their correct definitions.

____a.	A process of separating the color original into three black-and-white negatives	1. Complementary color
____b.	The process of compensating for ink deficiencies in making separation negatives	2. Moire
____c.	One or more notches on one corner of a sheet of film used to identify the emulsion and emulsion side of the film	3. Panchromatic film
____d.	The color that is opposite another color on a color wheel	4. Color separation
____e.	A blue-green color that is used in color separation and color printing	5. Primary colors
____f.	A dark pink color that is used in color separation and color printing	6. Color correction
____g.	A black-and-white photographic image of a color original used for color correction	7. Code notch
____h.	An undesirable pattern on a halftone negative created by the improper angling of the contact screen	8. Cyan
____i.	A gray-colored filter used to add density with no change in color	9. Mask
____j.	Film that is sensitive to all colors of light	10. Magenta
____k.	Colors which cannot be produced by mixing other colors	11. Separation negative
____l.	The negative that represents one of the primary colors from a color original	12. Neutral density filter
____m.	A system used to proof separation negatives	13. Scanner
		14. Acetate proofing system

TEST

_____n. A color separation device that electronically processes images through circuits that correct color and enhance detail

2. Distinguish between additive and subtractive primary colors by placing an "A" before descriptions of additive primary colors and an "S" before descriptions of subtractive primary colors.

_____a. These primary colors are blue, green, and red.

_____b. These primary colors are cyan, magenta, and yellow.

_____c. When these colors are mixed together in various proportions, they produce a full range of colors.

_____d. These are also called process colors.

_____e. When these colors are added together, they form white light.

3. Select true statements concerning the functions of printing inks by placing an "X" in the appropriate blanks.

_____a. One function of ink is to control the light that is permitted to strike the paper and to be reflected from it.

_____b. Magenta ink absorbs the blue part of white light.

_____c. Yellow ink absorbs the green part of white light.

_____d. Cyan ink absorbs the red part of white light.

_____e. Black ink absorbs all components of white light.

4. Select true statements concerning color separation by placing an "X" in the appropriate blanks.

_____a. Three plates are used for printing three colored inks.

_____b. The yellow printer separation negative is made by exposing through a blue filter.

_____c. The magenta printer separation negative is made by exposing through a red filter.

_____d. The cyan printer separation negative is made by exposing through a green filter.

_____e. Three separate negatives are needed for color separation, each one representing one of the primary colors.

TEST

5. Name the methods for making color corrections.

a. _____

b. _____

c. _____

* Permission to duplicate this test is granted.

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

ANSWERS TO TEST

1.
a.	4	h.	2
b.	6	i.	12
c.	7	j.	3
d.	1	k.	5
e.	8	l.	11
f.	10	m.	14
g.	9	n.	13

2.
a. A
b. S
c. S
d. S
e. A

3. a, d, e

4. a, b, e

5.
a. Photographic masking
b. Electronic scanning
c. Localized dot etching

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Job Sheet Ratings

Job Sheet #1—Make a Set of Unmasked Direct Screen Four-Color Separation Negatives Rating _____

Comments:

_____

_____

Job Sheet #2--Make an Acetate Overlay Proof Rating _____

Comments: _____

_____

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

_____

Teacher Signature _____ Date _____

Student Signature _____ Date _____

*Permission to duplicate this form is granted.

STRIPPING PROCEDURES
UNIT VI

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make a transparency from the transparency master included with this unit. Distribute photocopies of TM 1 to students for parts on a layout of a typical flat.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives, emphasizing many of these procedures are rapidly becoming obsolete as digital printing relegates them to computer tasks. (See Unit 8.)

E. Provide students with information sheet.

F. Discuss information sheet.

(NOTE: Use the transparency to enhance the information as needed.)

G. Provide students with job sheets.

H. Discuss and demonstrate the procedures outlined in the job sheets.

I. Integrate the following activities throughout the teaching of this unit:

1. Help students develop an understanding of different bend and gripper lines as they relate to different presses and the importance of knowing press specifications to determine accurate stripping procedures for each press.

2. Discuss different types of imposition that are used to lay out and prepare printed material.

3. If possible, plan a field trip to a nearby printing company where students may have the opportunity to see step-and-repeat equipment as well as electronic stripping devices in operation.

4. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

SUGGESTED ACTIVITIES

REFERENCES USED IN WRITING THIS UNIT

A. DeStree, Thomas M. *The Lithographer's Manual*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1994.

B. Cogoli, John E. *Photo-Offset Fundamentals*. Old Tappan, NJ: MacMillan Publishing Company, 1986.

SUGGESTED SUPPLEMENTAL MATERIAL

Texts

A. Film Image Assembly 0411, *Introduction to Film Assembly*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

B. Film Image Assembly 0421, *Basic Signature Imposition*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1980.

C. Film Image Assembly 0461, *Preparing Multiple-Image Imposition (Step-and-Repeat)*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1981.

D. Film Image Assembly 0451, *Assembling a Two-Color Booklet*. Pittsburgh, PA: Graphic Arts Technical Foundation, 1981.

STRIPPING PROCEDURES
UNIT VI

TEST

Name _____ Score _____

1. Match the terms on the right with the correct definitions.

_____a.	The process of fastening negatives to masking sheets to produce a flat	1. Flat
_____b.	Negative or negatives attached to masking sheet from which the offset plate is made	2. Emulsion side
_____c.	Special opaque paper or plastic sheet used to make the flat	3. Windows
_____d.	Openings in the masking sheet that expose image areas onto the offset plate	4. Rule
_____e.	Another name for masking paper; yellow or orange in color	5. Stripping
_____f.	To prevent light from passing through a material	6. Pinholes
_____g.	The side of the film coated with light-sensitive material	7. Opaque
_____h.	Small clear areas in the negative which would allow light to pass through if not detected and opaqued	8. Goldenrod
_____i.	Red tape; opaque in nature	9. Lithographer's tape
_____j.	A line scribed or scratched on a negative	10. Masking sheet
_____k.	The process of repeating the exposure of a flat several times on an offset plate	11. Pin register
_____l.	To print the image in the exact same position on each sheet of paper	12. Step-and-repeat
_____m.	Small crosses, guides, or patterns placed on originals and flats to aid registration	13. Register
		14. Combination printing
		15. Imposition guide
		16. Main flat
		17. Register marks
		18. Complementary flat
		19. Signatures
		20. Double burn

TEST

_____n. Flat containing the key negatives of a multi-color job

_____o. A flat containing negatives for only one color or part of a multi-color job

_____p. Printing line copy on top of a halftone

_____q. Usually two, four, eight, or sixteen pages printed on a single sheet to be folded and trimmed as a book or part of a book

_____r. A sheet marked to show the page positions

_____s. Accurate system of registration using punched negatives, flats, plates, and positioned register pins

_____t. Exposing a plate twice using two complementary flats

2. Match the stripping tools and materials on the right with their proper uses.

_____a. A single-edged, pointed razor blade, affixed to a handle, used to cut masking sheets and windows

_____b. A fine-pointed artist tool used to apply opaquing solution to a negative

_____c. Instrument, usually stainless steel or plastic, used to square work on a light table

_____d. Instrument, usually stainless steel or plastic, used to measure, rule, and cut along an edge

_____e. Holds rolls of tape and contains attached cutting edge

_____f. Metal or plastic 45-45-90 or 30-60-90 degree triangles used to rule and cut along specific lines

_____g. A shaped, sometimes looped point with handle for scratching lines on negatives

1. Triangles
2. Opaque brush or pen
3. Scribing tool
4. Magnifier
5. T-square
6. Tape dispenser
7. Light table
8. Line-up table
9. Straight edge ruler
10. Scissors
11. Register pins and punches
12. Stripping knife

TEST

_____h. A table with a frosted glass top and a light underneath to view flats and negatives

_____i. Magnifying glass mounted on a small frame; used to detect negative flaws

_____j. Used to secure flats and plates for close registration

_____k. Cutting instrument used in trimming

_____l. Light table with built-in vertical and horizontal straight edges, calibrated for accuracy

_____m. Used to prevent light from reaching the plate

_____n. Used to tape masking sheets to the light table

_____o. Used to fasten negatives to the masking sheet and cover large pinholes

_____p. Used to cover pinholes and scratches

_____q. Peelable film used for stripping multi-color work

13. Opaque solution

14. Ruby or amber peel coat

15. Lithographer's tape

16. Goldenrod

17. Masking tape

TEST

3. Identify the parts on the layout of a typical flat illustrated below. Write the correct names in the corresponding blanks.

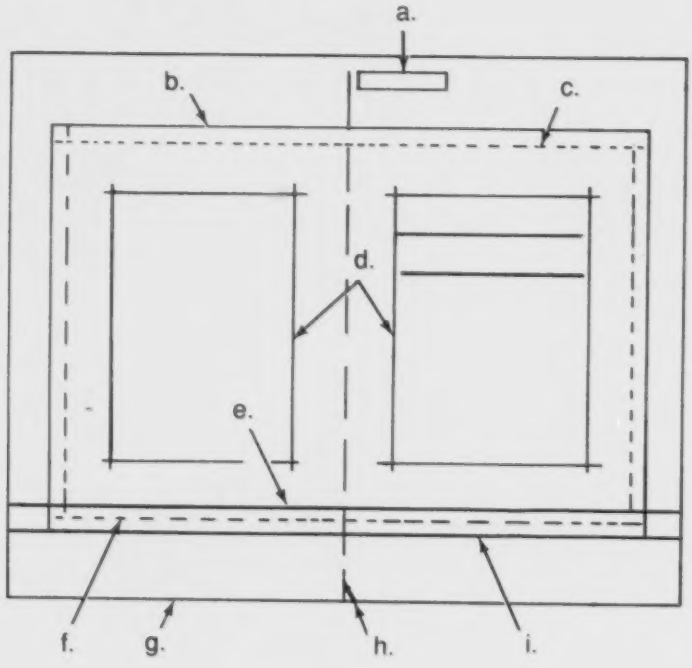
a. _____ f. _____

b. _____ g. _____

c. _____ h. _____

d. _____ i. _____

e. _____



TEST

4. Select true statements concerning the emulsion side and the base side of a negative by placing an "X" in the appropriate blanks.

   _____a. The emulsion side of the negative can be scratched to allow light to pass through.

   _____b. The base side of the negative carries the image.

   _____c. The base side of the negative is right-reading.

   _____d. The emulsion side of the negative is backward or wrong-reading.

   _____e. The emulsion side of the negative is coated with a non-reflective dye.

   _____f. The emulsion side of the negative is made of polyester or acetate base.

5. Select true statements concerning the methods of combining line and halftone work by placing an "X" in the appropriate blanks.

   _____a. To strip a halftone negative into the window of a line negative, the window must be clear.

   _____b. Halftone windows are cut from any color material for paste-up.

   _____c. When line and halftone negatives are stripped separately to the same flat, windows must be cut in the flat.

   _____d. When line and halftone negatives are stripped separately to the same flat, both negatives must be trimmed.

   _____e. Stripping and exposing negatives on separate flats requires only a single plate burn.

   _____f. Stripping and exposing negatives on separate flats requires careful positioning of negatives on flats.

6. Name two types of combination printing.

   a. _____

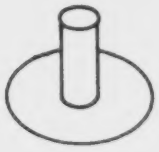
   b. _____

7. Identify the following stripping register marks and pins.

   a. _____ b. _____

TEST

c. _____ d. _____



e. _____

* Permission to duplicate this test is granted.

STRIPPING PROCEDURES
UNIT VI

ANSWERS TO TEST

1.

a.	5		k.	12
b.	1		l.	13
c.	10		m.	17
d.	3		n.	16
e.	8		o.	18
f.	7		p.	14
g.	2		q.	19
h.	6		r.	15
i.	9		s.	11
j.	4		t.	20

2.

a.	12		j.	11
b.	2		k.	10
c.	5		l.	8
d.	9		m.	16
e.	6		n.	17
f.	1		o.	15
g.	3		p.	13
h.	7		q.	14
i.	4			

3.
a. Position of cut-out for gray scale
b. Size of press sheet
c. Final trim size
d. Image positions laid out
e. Image limit
f. Sheet gripper margin
g. Leading edge of plate
h. Wedge cut out to indicate leading edge of plate
i. Leading edge of press sheet

4. a, c, d

5. a, c, d, f

6.
a. Positive lettering printed on top of halftones
b. Reversed lettering printed on top of halftones

7.
a. Alignment or single run
b. Second run
c. Fourth run
d. Third run
e. Round register pin

BEST COPY AVAILABLE

STRIPPING PROCEDURES
UNIT VI

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Job Sheet Ratings

Job Sheet #1—Lay Out and Strip an Unruled Flat (wrong reading) Rating _____

Comments: _____

_____

Job Sheet #2—Strip a Ruled Flat (right reading) Rating _____

Comments: _____

_____

Job Sheet #3—Strip for Step-and-Repeat Rating _____

Comments: _____

_____

Job Sheet #4—Combine Line and Halftone Work Rating _____

Comments: _____

_____

Job Sheet #5—Strip for Combination Print (double burn) Rating _____

Comments: _____

_____

Job Sheet #6—Strip Complementary Flats for Multi-Color Printing Rating _____

Comments: _____

_____

UNIT EVALUATION FORM

Job Sheet #7—Lay Out Signature Flats for Multi-Page or Book Printing Rating _____

Comments: _____

_____

Job Sheet #8—Strip a Two-Color Job Using Pin Register and Masking Film Rating _____

Comments: _____

_____

Job Sheet #9—Expose a Blue-Line Proof Rating _____

Comments: _____

_____

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

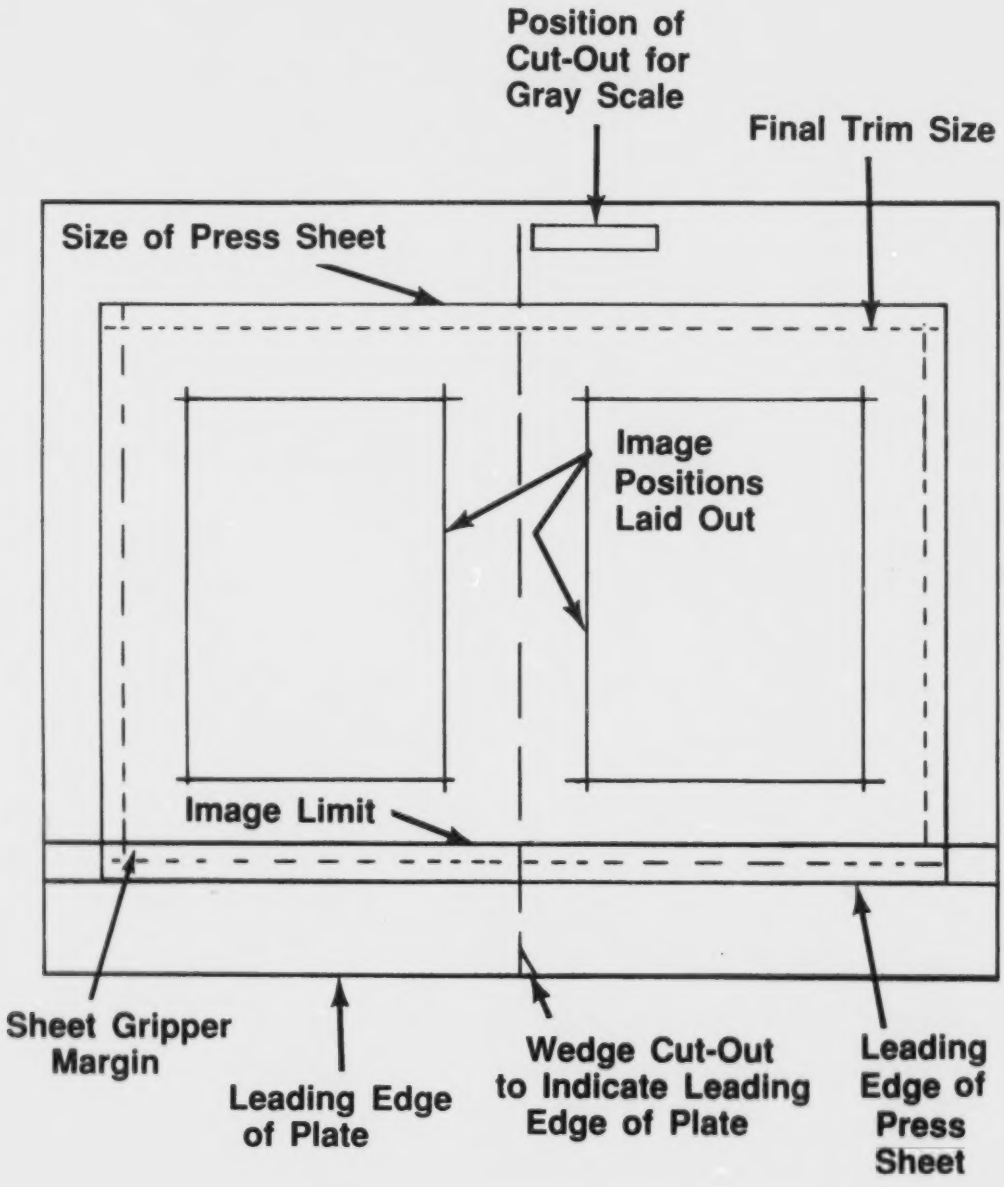
_____

Teacher Signature _____ Date _____

Student Signature _____ Date _____

*Permission to duplicate this form is granted.

Parts on a Layout of a Typical Flat


Position of Cut-Out for Gray Scale
Final Trim Size
Size of Press Sheet
Image Positions Laid Out
Image Limit
Sheet Gripper Margin
Leading Edge of Plate
Wedge Cut-Out to Indicate Leading Edge of Plate
Leading Edge of Press Sheet

PLATEMAKING PROCEDURES
UNIT VII

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/ reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives.

E. Provide students with information sheet.

F. Discuss information sheet.

(NOTE: Use the transparencies to enhance the information as needed.)

G. Provide students with job sheets.

H. Discuss and demonstrate the procedures outlined in the job sheets, emphasizing that many of these procedures likely will become obsolete in the future as computer-to-plate technology becomes widely adopted. See Unit 8.

I. Integrate the following activities throughout the teaching of this unit:

1. Help students develop an understanding of different types of printing plates and exposure systems by planning a field trip to a nearby printing company. Watching a skilled technician strip-up a four-color process job with related areas of flat color would be extremely informative for students.

2. Supplement instruction provided in this unit with related audio-visual materials or guest speakers. An area technical representative from a plate manufacturing company would be a good resource person to speak to the class. Emphasize changing technology.

3. Job Sheet #6 deals with a photo-direct platemaking procedure. Many school shops do not have this type of equipment although it is an important part of platemaking technology. Once again a field trip to a quick-print shop or other printing establishment that might have this type of equipment would be helpful to supplement student learning. Perhaps the instructor could obtain an exposed and processed photo-direct plate to use on a press in the school shop to give students the opportunity to work with this type of imaging technology.

SUGGESTED ACTIVITIES

4. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. DeStree, Thomas M. *The Lithographer's Manual.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1988.

B. 3-M Imaging Systems Group. *Press Operator's Guide.* St. Paul, MN: 3-M Printing and Publishing Systems, 1989.

(NOTE: This publication contains platemaking information formerly found in the 3-M *Platemaker's Guide* which is no longer in print.)

SUGGESTED SUPPLEMENTAL MATERIAL

Text – Cogoli, John E. *Photo-Offset Fundamentals.* Old Tappan, NJ: MacMillan Publishing Company, 1986.

Audio-visual materials

A. *Introduction to Lithographic Platemaking* (AV 60), 35mm slides with tape, 1972.

Available from:

Graphic Arts Technical Foundation
4615 Forbes Ave.
Pittsburgh, PA 15213-3796
(412) 621-6941

SUGGESTED SUPPLEMENTAL MATERIAL

B. *Plates and Platemaking*, VHS videotape, 1986.

Available from:

Sunshine Enterprises
P.O. Box 13245
Spokane, WA 99213

PLATEMAKING PROCEDURES
UNIT VII

TEST

Name _____ Score _____

1. Match the terms on the right with their correct definitions.

_____a.	A plate where tiny pits or indentations in the surface of the plate allow it to carry water	1. Light-sensitive coating
_____b.	A solution used to desensitize an additive plate	2. Ink-repellent
_____c.	Diazo compound or photopolymer which, after exposing and processing, creates image area on plate	3. Squeegee
_____d.	Solution used to preserve plate and protect surface from oxidation	4. Process gum/ desensitizer
_____e.	A plate in which the image and non-image areas are level; may be exposed from either a negative or positive film flat depending on plate coating	5. Grained plate
_____f.	A plate in which the image is etched slightly below the surface; exposed from a flat composed of film positives	6. Gray scale
_____g.	A smooth rubber blade used to wipe moisture from plate surface	7. Ink-receptive
_____h.	Areas on plate which accept and hold ink and reject water	8. Gum arabic
_____i.	Areas on plate which accept and hold water and reject ink	9. Deep-etch plate
_____j.	A commercially produced sensitivity guide with a 12-step negative representing the various tones from white to black; used by platemakers to determine plate exposure	10. Surface plate
_____k.	A plate whose surface is grainless	11. Smooth plate
_____l.	A shadow around the edge of a halftone created by improper stripping or platemaking procedures	12. Blind
		13. Broken image
		14. Dot
		15. Halo
		16. Dot spread
		17. Dot loss
		18. Hone
		19. Lacquer
		20. AGE
		21. Image-add pen

TEST

_____m. The individual element of a halftone

_____n. Disappearance of a dot from the plate

_____o. Dot enlargement on the plate

_____p. An incomplete image on the plate

_____q. An imaged plate surface that will not accept ink

_____r. An abrasive stone used to remove unwanted marks on the plate surface

_____s. Solution used for hardening the image area of an additive plate

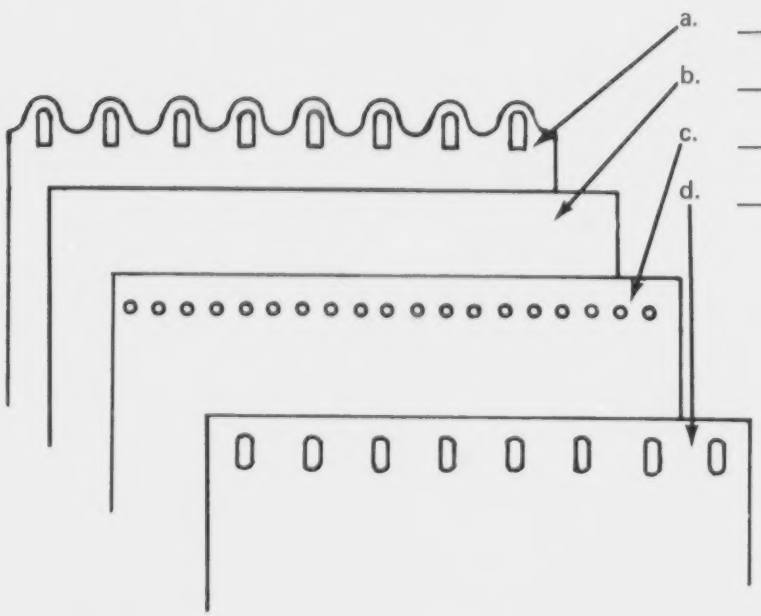
_____t. Solution used to eliminate plate flaws or unwanted image areas

_____u. Protective gum storage chemical used for long term plate storage

_____v. Fiber-tip pen used to repair broken images on plate surface

22. Deletion fluid

2. Identify the types of plate ends below.



a. _____

b. _____

c. _____

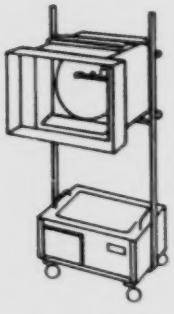
d. _____

TEST

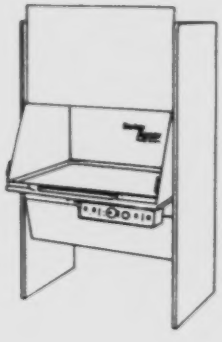
3. Match the types of offset plates on the right with their correct characteristics.

_____a.	Has no sensitized coating; image accomplished by typing or hand lettering.	1.	Wipe-on
_____b.	Made directly in automatic platemakers making intermediate step unnecessary.	2.	Electrostatic
_____c.	Light-sensitive coating is applied in shop immediately before exposure.	3.	Direct-image
_____d.	Light-sensitive coating is applied during plate manufacturing.	4.	Photo-direct
_____e.	Image is produced on plate surface by an electrostatic charge.	5.	Presensitized
_____f.	Image area is chemically etched to a depth slightly below nonprinting area; common types are single and multimetal.	6.	Deep-etch

4. Identify the following plate exposing devices.

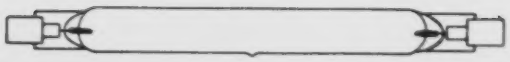


a. _____

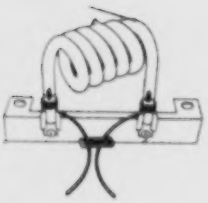


b. _____

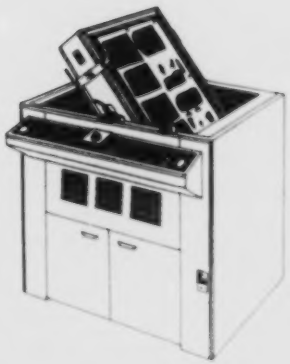
TEST



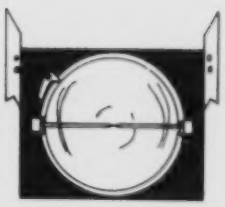
c. _____



d. _____



e. _____



f. _____

5. Match the types of presensitized plates on the right with their characteristics.

_____a.	A special ink-holding coating is added during developing process	1.	Additive-working
		2.	Negative-working
_____b.	Have a factory applied synthetic lacquer coating which is removed during development	3.	Positive-working
		4.	Subtractive-working

TEST

_____c. Produce an image area in all places on the plate that are struck by light during exposure

_____d. Produce an image area in all places on the plate not struck by light during exposure

6. Select true statements concerning the gumming of plates by placing an "X" in the blanks beside the true statements.

_____a. After applying gum arabic or finisher to plate, the plate should be immediately hung up to dry.

_____b. If plate has been run, clean both sides before gumming.

_____c. Hang up plates in such a way so that plates lie against each other.

_____d. Gum arabic is used for long term plate storage.

7. Select true statements concerning handling and storing plates by placing an "X" in the blanks beside the true statements.

_____a. Lift plates by opposite corners to avoid crimping or scratching.

_____b. Avoid touching plate surfaces with fingers before and after processing.

_____c. Pick up plates at center using only thumb and index finger.

_____d. Plates should be stored in vertical hanging envelopes.

8. Select true statements related to the do's and don'ts for properly handling plates and chemicals by placing an "X" in the blanks beside the true statements.

_____a. **Do** shake chemicals well before using.

_____b. **Do** look directly at light sources.

_____c. **Do not** lean on glass-topped vacuum frame.

_____d. **Do not** breathe chemical fumes.

_____e. **Do** adhere to HMIS chemical handling procedures.

*Permission to duplicate this test is granted.

PLATEMAKING PROCEDURES
UNIT VII

ANSWERS TO TEST

1.

a.	5	f.	9	k.	11	p.	13	u.	20
b.	4	g.	3	l.	15	q.	12	v.	21
c.	1	h.	7	m.	14	r.	18		
d.	8	i.	2	n.	17	s.	19		
e.	10	j.	6	o.	16	t.	22		

2.
a. Serrated/loop
b. Straight cut
c. Pinbar
d. Slotted/oval

3.
a. 3
b. 4
c. 1
d. 5
e. 2
f. 6

4.
a. Stand-alone exposing unit
b. Overhead exposing unit
c. Mercury vapor/metal halide lamp
d. Pulsed-xenon light
e. Flip-top exposing unit
f. Carbon-arc light

5.
a. 1
b. 4
c. 2
d. 3

6. b

7. a, b, d

8. a, c, d, e

PLATEMAKING PROCEDURES
UNIT VII

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Job Sheet Ratings

Job Sheet #1—Expose and Develop a Subtractive Plate Rating _____

Comments: _____

_____

Job Sheet #2—Determine Plate Exposure Using a Step-Off Test Rating _____

Comments: _____

_____

Job Sheet #3—Expose a Step-and-Repeat Plate Rating _____

Comments: _____

_____

Job Sheet #4—Expose a Plate When Using a Screen Tint Rating _____

Comments: _____

_____

Job Sheet #5—Make Plates for a Two-Color Job Rating _____

Comments: _____

_____

Job Sheet #6—Expose a Photo-Direct Plate Rating _____

Comments: _____

_____

UNIT EVALUATION FORM

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other_____

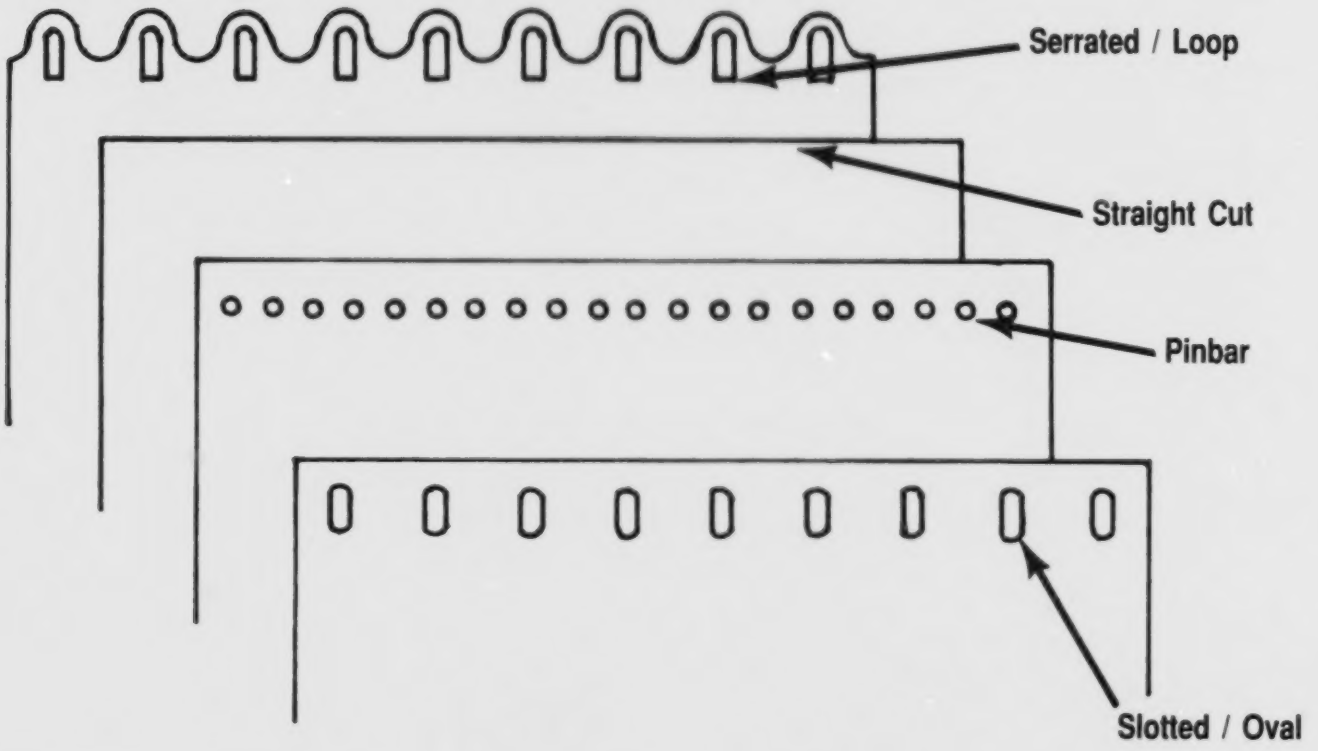
_____

Teacher Signature _____ Date _____

Student Signature _____ Date _____

*Permission to duplicate this form is granted.

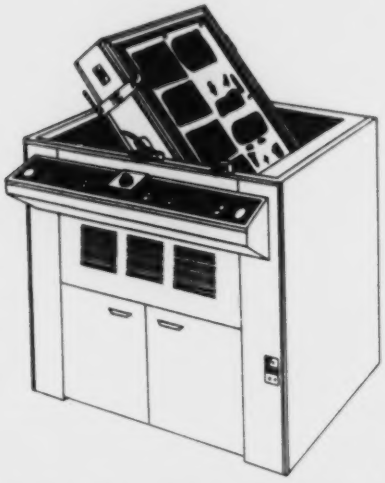
Four Types of Plate Ends



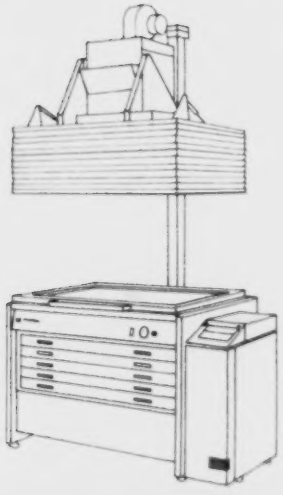
TM 1

GII-T105

Plate Exposing Devices

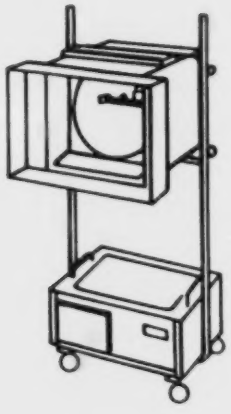


Flip-Top Exposing Unit



Overhead Exposing Unit

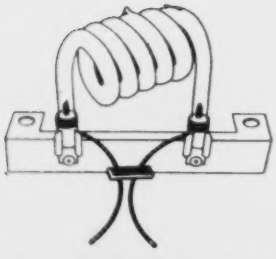
Courtesy of Burgess Industries, Inc.,
Plymouth, Minnesota



Stand-Alone Exposing Unit
(Used with stand-alone vacuum printer for exceptionally large offset plates)

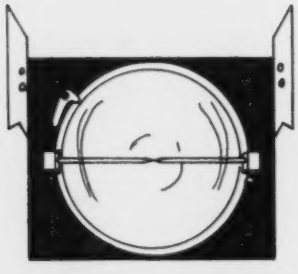
Courtesy of Burgess Industries, Inc.,
Plymouth, Minnesota

Light Sources for Plate Exposing Devices



Pulsed-Xenon Light (Helical Type)

Courtesy of Burgess Industries, Inc., Plymouth, Minnesota



Carbon-Arc Light

Mercury Vapor or Metal Halide Lamp

Courtesy of Burgess Industries, Inc., Plymouth, Minnesota

(NOTE: Carbon arc is the oldest and least used of the available light sources. It is found only in flip-top and stand-alone units. The other two light sources may be found in any of the three types of exposure units.)

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to teaching this unit.)

B. Make transparencies from the transparency masters included with this unit.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives, emphasizing the importance of digital technology in prepress activities already covered elsewhere in this manual.

E. Provide students with access to personal computer and desktop publishing software, along with a laser printer. Explain this equipment's use, familiarize students with basic controls and commands. Save a text file and a graphics file for use in Job Sheet #1 as students use the equipment to output a camera-ready laser copy.

F. Provide students with information sheet.

G. Discuss information sheet.

(NOTE: Use transparencies in class to enhance information found in the information sheet as needed.)

H. Discuss Student Supplements #1-#3 and how they relate to assignment sheets. Assign the prescribed research and assign reports based on the assignment sheets.

I. Discuss and demonstrate the procedures outlined in the job sheet, according to the operations of DTP hardware and software in your class.

J. Integrate the following activities throughout the teaching of this class.

1. Help students understand the dramatic changes digital technology is causing on the printing industry and careers of those involved.

2. If possible, plan a field trip to a printing operation undergoing the transition to digital prepress activities to allow students the opportunity to ask questions of the employees and management personnel concerning the transition and where they will fit in the industry as future employees.

3. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

SUGGESTED ACTIVITIES

K. Give test.

L. Evaluate test.

M. Reteach if necessary.

REFERENCES USED IN WRITING THIS UNIT

A. Bruno, Michael H. *Printing in a Digital World.* Pittsburgh, PA: Graphic Arts Technical Foundation, 1995.

B. *Pocket Pal, A Graphic Arts Handbook.* Memphis, TN: International Paper Co., 1992.

C. *PageMaker 5.0 Introduction, Student Manual.* Rochester, NY: Logical Operations, 1993.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

ANSWERS TO ASSIGNMENT SHEETS

1. **Assignment Sheet #1**

   Student should provide instructor with at least 12 current articles from printing industry periodicals concerning staffing, training and changing roles of printers and their customers in the digital printing age.

2. **Assignment Sheet #2**

   Report concerning CTP technology's effects on staffing and training needs of the printing industry, along with discussion of personnel and workflow problems one might encounter in a shop adopting CTP technology. Evaluated to the satisfaction of the instructor.

3. **Assignment Sheet #3**

   Report discussing changing viewpoints of printers and their customers concerning cost, service and competitiveness in the face of the growing influence of digital printing technology. Evaluated to the satisfaction of the instructor.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

TEST

Name _____ Score _____

1. Match the terms on the right with the correct definitions.

_____a.	The product of imagesetting equipment in fully composed pages	1. CTP
_____b.	The degree to which overprinting colors overlap to eliminate white lines between colors in printing	2. Desktop publishing (DTP)
_____c.	Technology which allows the output of a digitized document directly to a platemaker, press or other printing device	3. Digital imaging
_____d.	A device which encodes a computer's page description language into bit maps used by an image setting machine	4. Digital printing
_____e.	Using a personal computer, appropriate software, and an output device to combine text and graphics to produce a document	5. Direct imaging
_____f.	A machine combining the functions of a printer, recorder and RIP which is capable of outputting a fully composed page to a platemaker, press or other printing device	6. Imagesetter
_____g.	A system using computer and electronic technologies to integrate color separation, correction, retouching, page makeup, text editing and imposition—without the use of intermediate film steps	7. RIP
_____h.	The use of digitized files to drive equipment which produces reproductions directly on a substrate without the need for intermediate films or plates	8. Trapping

TEST

2. Select from the following the two types of digital printing systems by placing an "X" in the blanks next to the correct systems.

_____a. Computer-to-plate—systems which use digital information to create a printing plate directly, without the use of intermediate films

_____b. Digital Pulse Engraving—systems which use digital information to control a Telsa coil and pulsed-arc to engrave gravure and flexography plates without intermediate films

_____c. Computer-to-print—systems which use digital information to control electro-photographic, ionographic, magnetographic, ink-jet or thermal transfer imaging to produce reproductions directly, without the use of intermediate films or plates

_____d. CompuGraphic X1000 & X4400—systems using digital engineering so advanced it is still classified and not yet commercially available

3. Distinguish among three types of computer-to-plate printing systems by circling the correct choices from the answers provided.

a. Plates or image carriers for gravure and flexography on which images can be produced by etching the surface with **(an acidic fountain solution/lasers or electromechanical engravers).**

b. High-speed light-sensitive plates for lithography coated with emulsion to be exposed by low-power **(visible/infrared)** lasers.

c. Non-light-sensitive plates for lithography coated with emulsion on which images can be exposed by **(a controlled radiation burst/heat)** rather than light.

4. Explain the unique capability of computer-to-print systems.

_____

_____

_____

_____

TEST

5. List three technologies using computer-to-print engineering.

   a. _____

   b. _____

   c. _____

6. Compare and contrast a conventional printing operation to a digital printing operation.

_____

_____

_____

_____

_____

_____

_____

_____

*Permission to duplicate this test is granted.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

ANSWERS TO TEST

1.
a. 3
b. 8
c. 1
d. 7
e. 2
f. 6
g. 4
h. 5

2. a, c

3. a. lasers or electromechanical engravers
b. visible
c. heat

4. Evaluated to the satisfaction of the instructor. Answer should include reference to electrostatic imaging and the ability to vary printing job from impression to impression.

5. The following in any order:
   a. Electronic printers
   b. Color copiers
   c. Electronic printing systems

6. Evaluated to the satisfaction of the instructor. Answer should contain references to the lack of paste-up, several editing steps, outside photography, etc.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

UNIT EVALUATION FORM

Student Name _____ Unit Rating _____

Assignment Sheet Ratings

Assignment Sheet #1—Collect Current Event Material Relating to Digital Printing Rating _____

Comments: _____

_____

Assignment Sheet #2—Compare and Contrast the Changes in Staffing and Training Needs in a Shop Adopting CTP Technology Rating _____

Comments: _____

_____

Assignment Sheet #3—Analyze Effects of Digital Printing on the Printer's and Customer's View of Cost, Service and Competitiveness Rating _____

Comments: _____

_____

Job Sheet Rating

Job Sheet #1—Create a Camera-Ready Laser Copy of a Page Containing Text and Graphics Rating _____

Comments: _____

_____

UNIT EVALUATION FORM

Written-Test Scores

Pretest _____ Posttest____ Other _____

Other

_____

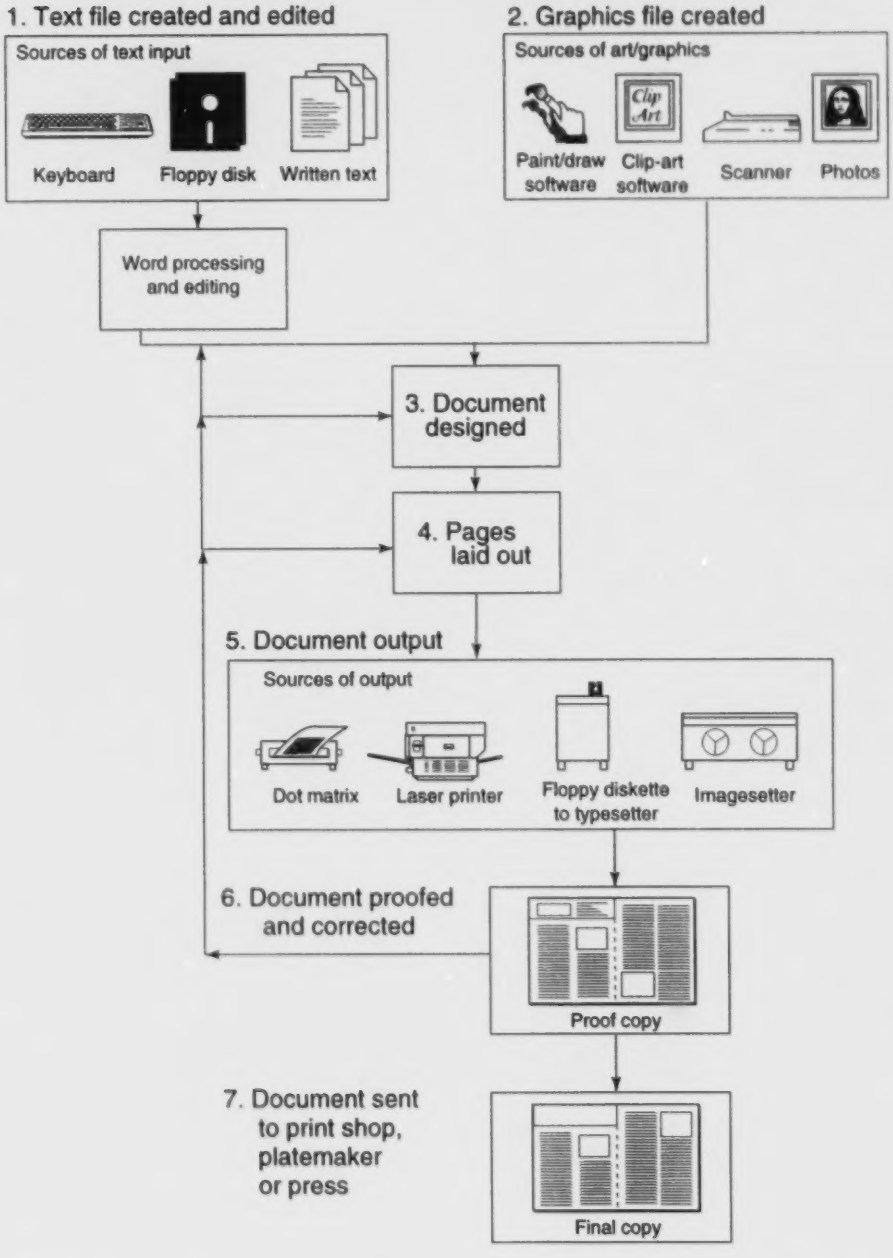
_____

Teacher Signature _____ Date _____

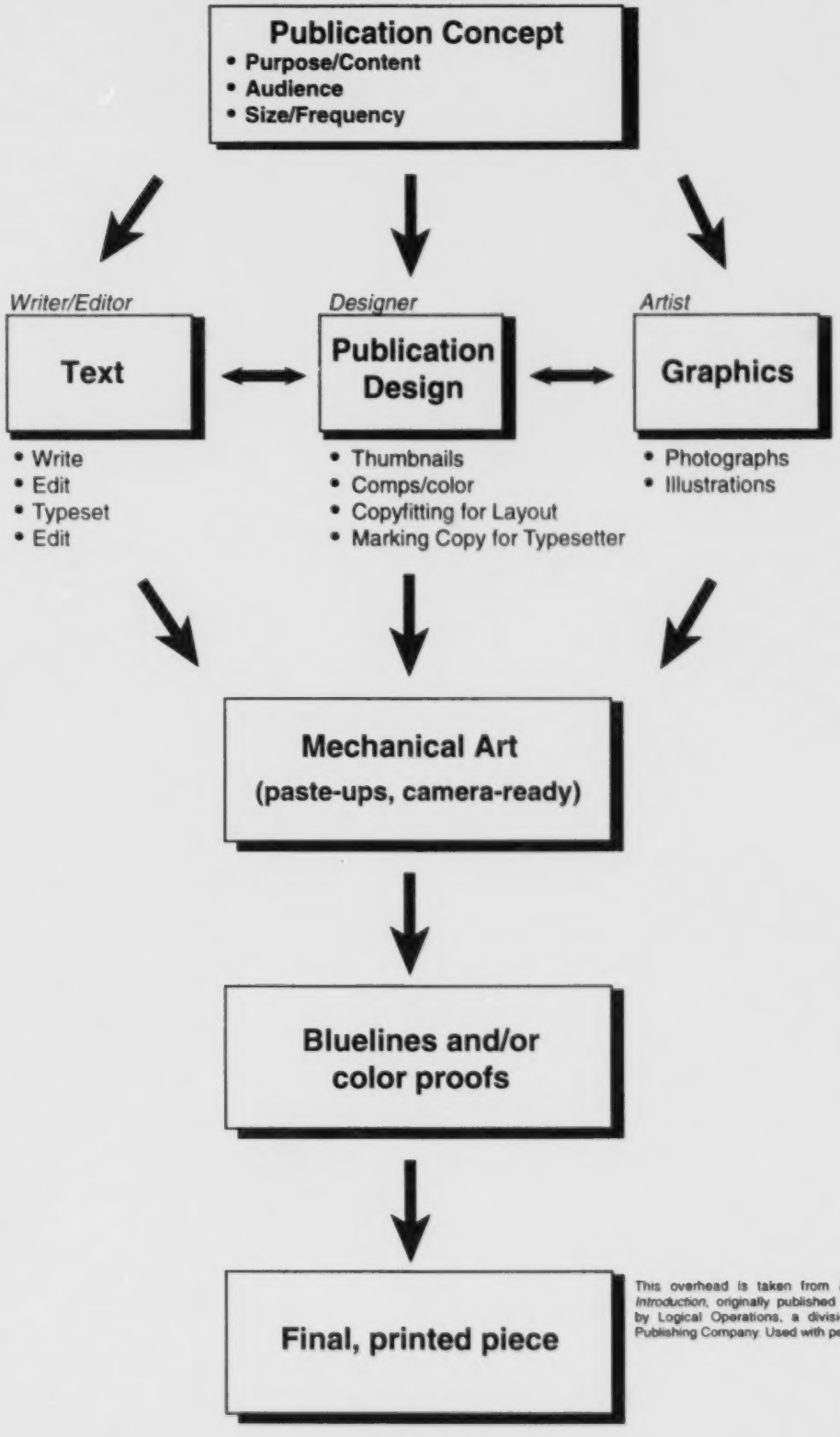
Student Signature _____ Date _____

*Permission to duplicate this form is granted.

Typical Steps in a DTP Document-Production Cycle



Overview of Traditional Publishing



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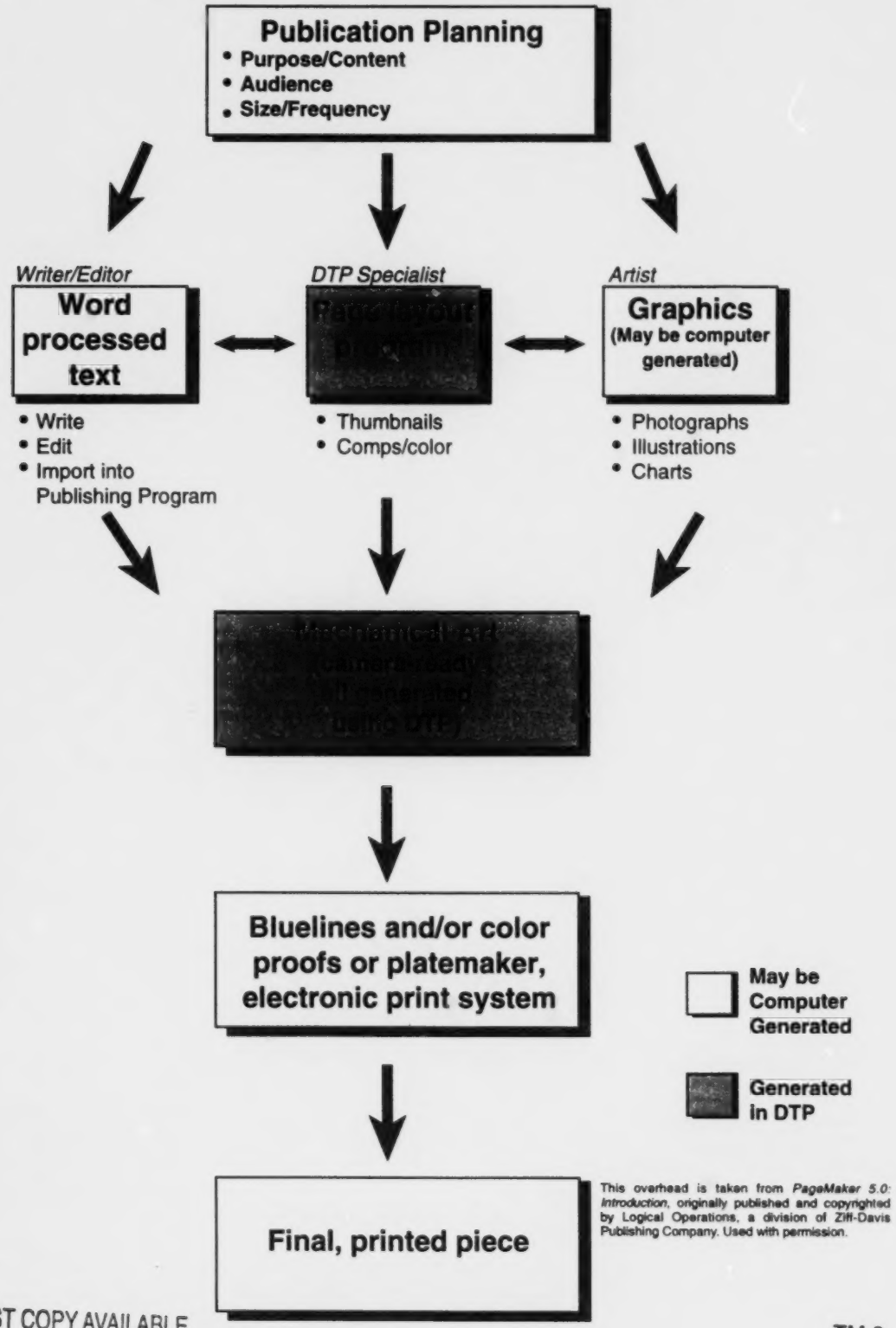
TM 2

Overview of Desktop Publishing



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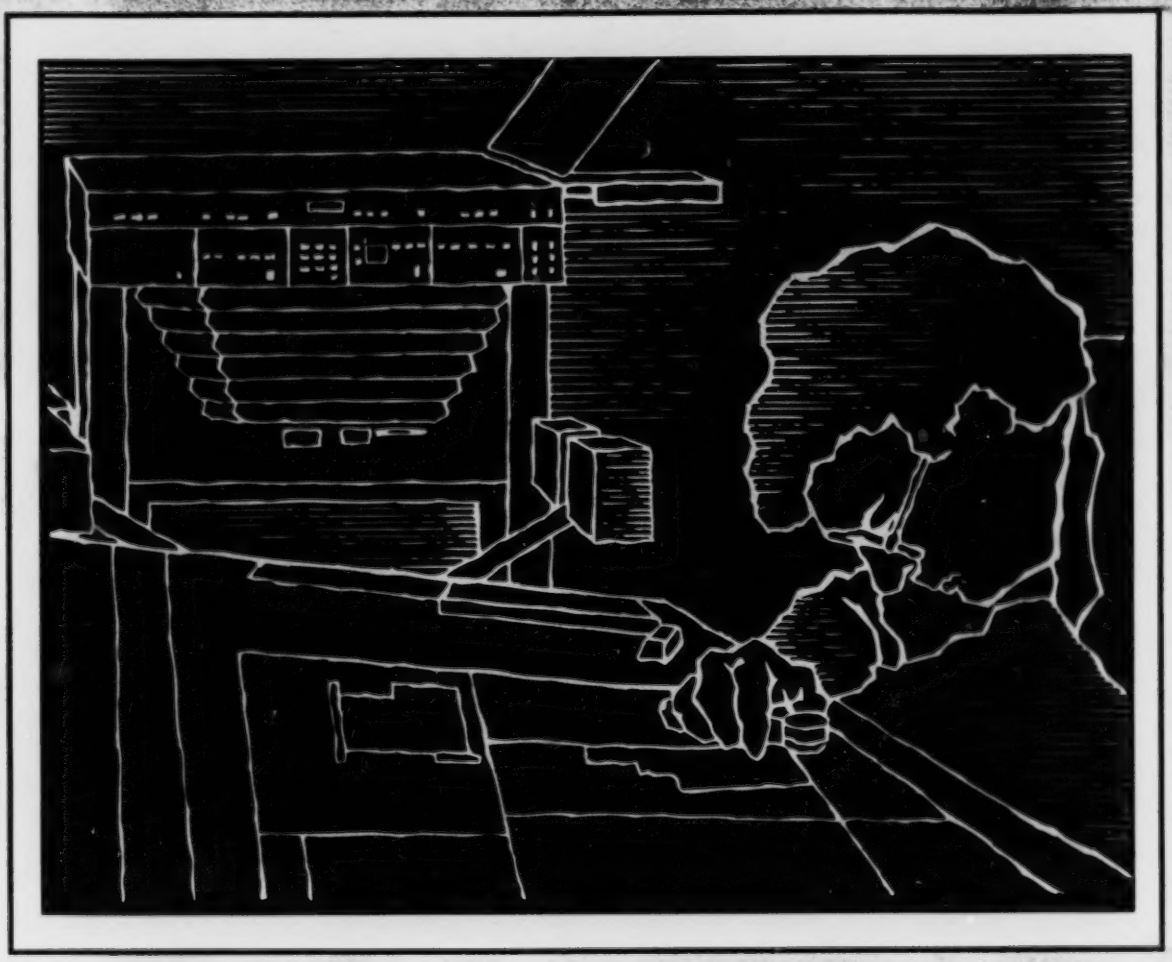
TM 3

GRAPHIC ARTS

PROCESS CAMERA STRIPPING PLATEMAKING



STUDENT EDITION

MAVCC

Graphic Arts

Process Camera, Stripping, and Platemaking

Third Edition

Student Edition

Revised by

Dan Crummett

Project Coordinated by

Jane Huston

Developed by

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Graphic Arts
Process Camera, Stripping, and Platemaking
Third Edition

Student Edition

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THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to set up a graphic arts darkroom, use a process camera to expose graphic arts film, and process a line negative. Competencies will be demonstrated by completing the assignment sheets, job sheet, and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define a process camera.
2. Identify types of process cameras.
3. Identify the parts of process cameras.
4. Match the parts of a process camera with their functions.
5. Match types of camera copy with their descriptions.
6. Match darkroom equipment/supplies with their uses.
7. Match types of camera film with their physical characteristics.
8. Select true statements concerning darkroom cleanliness.
9. Select true statements concerning darkroom safety.
10. Interpret Hazardous Materials Identification System (HMIS) labels.
11. Collect types of copy. (Assignment Sheet #1)
12. Complete a darkroom safety worksheet. (Assignment Sheet #2)
13. Prepare a darkroom for tray processing, and expose and develop a line negative. (Job Sheet #1)

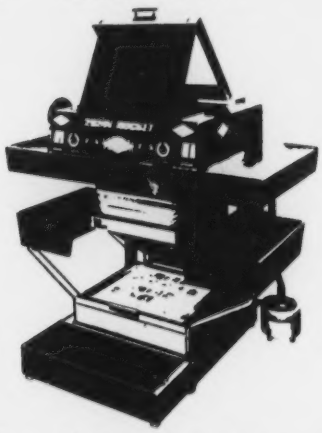
THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

INFORMATION SHEET

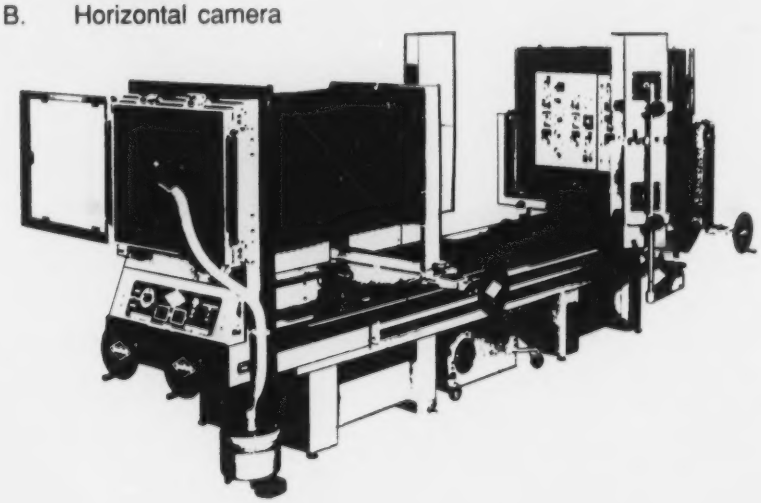
I. **Definition of a process camera** — A large, sturdy camera used for photographing flat surfaces

II. **Types of process cameras** — (Transparency 1)

A. Vertical camera



B. Horizontal camera



INFORMATION SHEET

III. Parts of process cameras (Transparencies 2 and 3)

A.	Copyboard	H.	Copyboard control
B.	Camera lights	I.	Vacuum pump
C.	Lens board	J.	Timer
D.	Bellows	K.	Shutter
E.	Ground glass	L.	Diaphragm
F.	Film back	M.	Lens
G.	Lens board control	N.	Tapes

IV. Parts of a process camera and their functions

A. Copyboard — A flat surface used to hold copy, equipped with a hinged glass cover to hold copy in place

B. Camera lights — Attached to the copyboard and used to illuminate copy

C. Lens board — Holds the lens, diaphragm, and shutter

D. Bellows — A light-tight, accordion-like chamber between the front case and camera back

E. Ground glass — A piece of ground or frosted glass that is positioned on the back of the camera to aid in focusing

F. Film back — A hinged gate that holds the film in place, usually by means of a vacuum

G. Lens board control — A crank which changes the position of the lens board for a correct size and properly focused image

H. Copyboard control — A crank which changes the position of the copyboard for a correct size and properly focused image

I. Vacuum pump — A vacuum device with the hose attached to camera back

J. Timer — A timing device that is linked to the shutter

K. Shutter — A device that controls the duration of light striking the film

L. Diaphragm — A device that controls the quantity of light striking the film

(NOTE: A diaphragm is also referred to as an aperture.)

INFORMATION SHEET

M. Lens — One or more pieces of optical glass designed to collect and focus rays of light to form a sharp image on film

(NOTE: Some cameras may have filter holders which are attached to the lens mount and hold the filter in place; others may be incorporated into the lens shade.)

N. Tapes — Two narrow strips of thin, flexible steel or plastic marked off in percentage units

(NOTE: One tape is attached to front case and the other to the copyboard to show the exact ratio of enlargement or reduction of the copy.)

V. **Types of camera copy and their descriptions**

A. Line — Black and white copy consisting of a single shade of black usually on a white background

B. Halftone — Black and white copy with intermediate shades of gray

EXAMPLE: Black and white photograph

C. Full color — Illustrative material where subject matter is represented in full color (original hue)

VI. **Darkroom equipment/supplies and their uses**

A. Darkroom timer — Used to indicate elapsed time during processing or to operate or control darkroom equipment

B. Thermometer — A device used to measure the temperature of liquids

C. Graduate — A container used for mixing and measuring chemicals

D. Safelight — An enclosed darkroom lamp fitted with a filter to screen out light rays to which film and paper are sensitive

E. Camera (graphic arts) film — A photosensitive material consisting of a light sensitive emulsion, clear base material, and an antihalation coating

EXAMPLES: Lith and rapid access

F. Paper — A sensitized material with opaque base used for reproduction processes

G. Developer — A solution used to turn the latent image into a visible image on exposed films or photographic paper

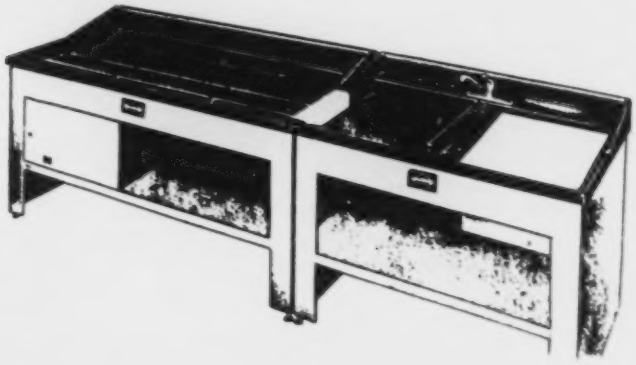
H. Stop bath — A weak solution of acetic acid, used in processing black and white film or paper; it stops development, prevents stains on paper, and makes the fixer last longer

INFORMATION SHEET

I. Fixer — A solution that removes any light-sensitive material not acted upon by light or developer, leaving a black and white negative or print that can no longer be affected by action of light

J. Temperature control sink — A source of running water with a built-in unit that cools or heats the water to desired temperature

K. Viewing table — A water-tight light table equipped with ortho safe and white light; may be used for film inspection during processing with ortho, or after processing with white light

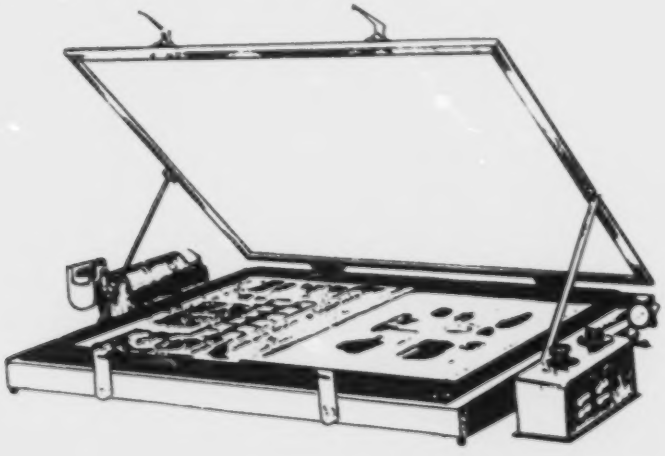


L. Film cutter — A device used to cut or trim large sheets of film or paper to desired size

(CAUTION: Keep fingers away from cutting edges.)

M. Contact printing frame — Used to make same size reproduction from a negative or any other transparent or translucent material

(NOTE: Many print shops, to make efficient use of equipment investments, use the plateburner to make same size—or contact prints—instead of investing in a separate contact printing frame.)



INFORMATION SHEET

N. Film dryer — An instrument that supplies heat and air to speed drying time on films and papers

O. Light trap — Method of providing entrance and exit from a darkroom without allowing light to enter the darkroom; the most common type is the revolving door

P. Diffusion transfer processor — A device that contains an activator and is used primarily for processing diffusion transfer materials

Q. Tray processing — Hand method of processing film using 3 trays and a running water bath; the trays contain developer, stop bath, and fixer

R. Automatic film processing — Mechanical device for processing film automatically using developer, fixer, wash, and dryer

VII. Types of camera (graphic arts) film and their physical characteristics (Transparency 4)

A. Lith — Basic camera film which provides high contrast negatives; it has a very narrow exposure latitude and requires precise control in development; requires a two part developer identified as part A and part B.

B. Rapid access — A continuous tone film used in camera work; has a high degree of latitude in processing and is the fastest system used for producing negatives; requires a one part developer.

VIII. Darkroom cleanliness

(NOTE: Dirt and dust in a darkroom can lower the quality of the developing and printing work done there. It is important to keep the darkroom clean.)

A. Keep as much equipment as possible off the floor where dust is likely to collect.

B. Mop the floor frequently.

C. If possible, install a ventilator with a dust filter, and replace or clean the filter often.

D. Keep all work surfaces clean.

E. Clean up spilled chemicals immediately.

(NOTE: Dried chemicals are a source cf dust.)

F. Set up and follow a regular cleanup routine.

G. No smoking.

INFORMATION SHEET

IX. Darkroom safety

(CAUTION: Working with chemicals and electrical equipment can be dangerous.)

A. Always keep supplies and equipment labeled and stored in the same location, and become familiar with each location.

B. Do not attempt to mix chemicals unless white room lights are on.

C. When mixing chemicals always pour chemical into water.

D. Wear suggested personal protective devices (apron, goggles and rubber gloves) when mixing film processing chemicals.

E. Have an eyewash station nearby in the event a chemical gets splashed into the eye(s).

F. Wash hands after coming into contact with film processing chemicals, and identify the source of irritant and obtain treatment if skin should become irritated.

G. Allow eyes to adjust to the darkroom environment before beginning work.

H. Clean up moisture on floors and working surfaces immediately to avoid slips and falls.

I. Store darkroom chemicals in non-breakable containers on the lowest available shelf.

J. Ground all electrical equipment.

K. Never handle electrical equipment with wet hands or when standing on a wet floor.

L. Darkroom equipment should always be turned off and unplugged before it is cleaned.

X. Hazardous Materials Identification System (HMIS) labels (Transparency 5)

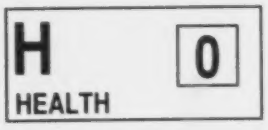
A. HMIS is a coding system used by the graphics industry to alert workers about potential health or physical hazards that may be created when using certain chemicals. Suggested personal protection devices are also part of the labeling system.

INFORMATION SHEET

B. The HMIS common labeling system as used by many printing plants consists of identifying hazardous material by using numbers, colors, symbols, and/or letters. The HMIS labeling system specifically identifies four areas which include the following:

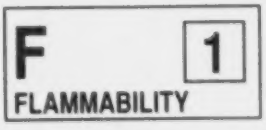
1. HEALTH HAZARD: Identified by the color **blue** and the letter **H**. The numbers 0-4 are used to indicate the severity of the health hazard as indicated below.

   4H — severe hazard
   3H — serious hazard
   2H — moderate hazard
   1H — slight hazard
   OH — minimal hazard



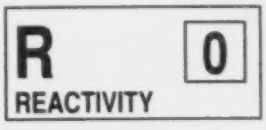
2. FLAMMABILITY HAZARD: Indicated by the color **red** and letter **F**. Severity of hazard indicated below.

   4F — extremely flammable
   3F — flammable
   2F — combustible
   1F — slightly combustible
   0F — will not burn



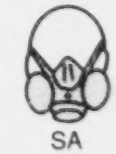
3. REACTIVITY HAZARD: Indicated by the color **yellow** and the letter **R**. Severity of hazard indicated below.

   4R — may detonate or explode
   3R — shock or heat may detonate
   2R — violent chemical change
   1R — unstable if heated
   0R — stable



4. The fourth section of the HMIS label consists of a combination of alphabetic characters and/or illustrations to recommend personal protection equipment as indicated below.

HMIS Personal Protection Symbols


SA

SB

SC

SF

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

ASSIGNMENT SHEET #1—COLLECT TYPES OF COPY

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student provided correct number of unique examples of each of three types of copy found in the printing process	_____

Introduction: In order to use the process camera according to industry standards, the student must be able to categorize the various types of copy available for reproduction.

Directions: In this activity, you are to collect different examples of copy and mount them on an 11 x 8 ½ inch piece of paper in the arrangement shown below. Be sure to write the headings as indicated.

Line Copy	Halftone Copy	Full Color Copy

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

ASSIGNMENT SHEET #2—COMPLETE A DARKROOM SAFETY WORKSHEET

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student completed the worksheet to instructor's satisfaction	_____

Introduction: The use of potentially harmful chemicals, electricity and varying light conditions make darkroom work hazardous if basic safety precautions are not followed. This exercise will familiarize the student with safety procedures and precautions which will prevent serious injury and ailment.

Directions: Given the situations below, complete each statement by giving the necessary information.

1. The primary objective of a shop safety program is to _____

_____

2. The camera should be operated or darkroom chemicals mixed only after a demonstration has been given by the _____ and the student has the permission of the _____ to complete the task.

3. _____ should be worn by the student when mixing or working with chemicals used in the darkroom.

4. When storing chemicals it is desirable to _____

_____

5. Darkroom equipment should always be _____ before it is cleaned.

6. If a camera operator's skin should become irritated by any of the film processing chemicals, the individual should _____

_____

7. If some film processing chemical is spilled on the floor, the camera operator should

_____

8. The correct way to mix film processing chemicals with water is to _____

_____

ASSIGNMENT SHEET #2

9. When a camera operator is ready to plug in the film drier while holding a wet piece of film, he/she should first _____

_____

10. In the event that some chemical gets splashed into the eye while mixing chemicals or performing other darkroom duties, an _____ should be available within the darkroom.

THE PROCESS CAMERA AND DARKROOM EQUIPMENT
UNIT I

JOB SHEET #1—PREPARE A DARKROOM FOR TRAY PROCESSING, AND EXPOSE AND DEVELOP A LINE NEGATIVE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom was prepared correctly for tray processing with chemicals placed in correct order	_____
• Negative was properly exposed and developed	_____

Introduction: A somewhat standard layout is associated with darkroom tray processing, whether it be a graphic arts darkroom or a hobby or professional photographic processing lab. This exercise will familiarize the student with that layout—based on the sequence of chemical use—and with procedures involved with process negative exposure and development.

A. Equipment

1. Trays (3)
2. Graduate
3. Thermometer
4. Storage containers (when necessary)

B. Supplies

1. Graphic arts film
2. Graphic arts developer
   (NOTE: This may be either lith or rapid access. Ask your instructor to help you identify which type.)
3. Stop bath, 28% acetic acid or indicator stop bath
4. Fixer solution (appropriate for type of developer used)
5. Copy collection from Assignment Sheet #1

C. Procedure

(NOTE: Since the quantity of chemical is dependent on the tray size to be used, ask your instructor how much to mix.)

1. Prepare developer in 1st tray. (Figure 1)

   (NOTE: Check manufacturer's recommendations.)

2. Prepare stop bath in 2nd tray. (Figure 1)

3. Prepare fixer solution in 3rd tray. (Figure 1)

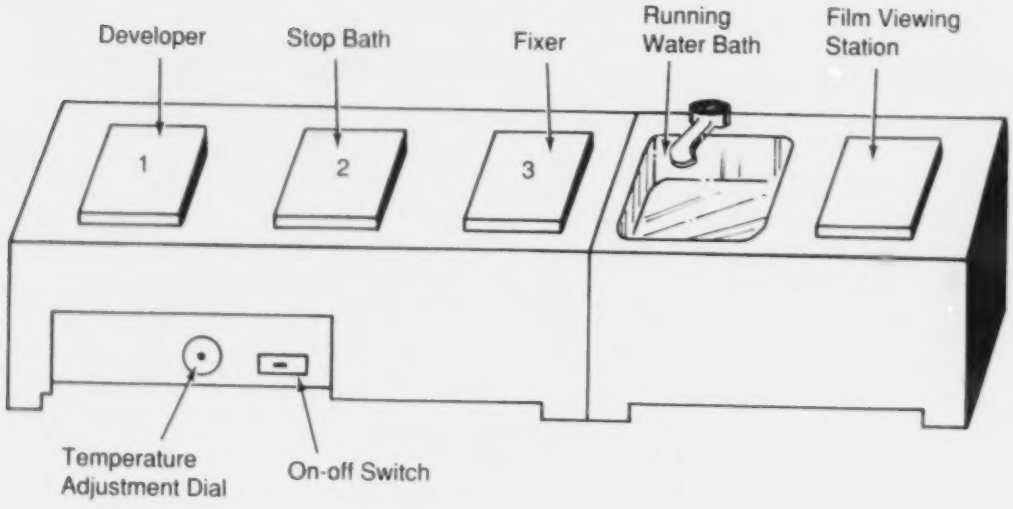
4. Place thermometer in sink.

JOB SHEET #1

5. Fill water jacket in sink according to recommendation of instructor.

6. Set temperature control unit on sink for type of film being used – lith type 68°F, rapid access usually 75-85°F. (Figure 1)

FIGURE 1



Temperature Control Sink Showing Sequence of Chemicals and Wash Basin

(NOTE: If the sink is not equipped with a temperature control unit, cold or hot water may be added to adjust water temperature in the water jacket. During the summer months, normal water temperature may not get cool enough for processing lith film. Cold water from a drinking fountain or ice may be added to the water jacket to provide necessary chemical temperature for film processing. Also, most developers can be used at temperatures other than the recommended ideal. In the case of temperatures warmer than the ideal, development times will be less than recommended, and with cooler temperatures than the ideal, development times will be longer. Consult with your instructor and/or developer labels for calculating proper development times if ideal temperature control is not possible.)

7. Place a thermometer in developer tray to assure solution is at the proper temperature before processing film.

8. Turn on safelights, and turn off white lights.

JOB SHEET #1

9. Locate copy you prepared for Assignment Sheet #1.

10. Mount copy in copyboard and set up camera for a 100% reproduction.

    (NOTE: Check with instructor for proper film, recommendations for exposure time, and processing time and procedure.)

11. Set exposure timer.

12. Mount film on vacuum back.

13. Make exposure.

14. Process film according to recommended procedure.

15. Evaluate negative for accurate reproduction of original copy.

    (NOTE: Have the instructor help you evaluate reproduction requirements of original copy.)

16. Clean work area.

LINE PHOTOGRAPHY
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to determine a basic exposure for a solid 4 on the gray scale and make necessary exposure adjustments to compensate for percentage of reproduction size and quality of copy. Competencies will be demonstrated by completing the assignment sheet, job sheet, and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to line photography with their correct definitions.
2. Complete statements concerning principles of line photography (theory of photography).
3. Distinguish between types of film base material.
4. Differentiate among types of emulsion.
5. Describe degrees of density.
6. State an exposure rule for recording density steps on a gray scale.
7. Identify parts of a typical lens assembly.
8. Select true statements concerning the characteristics of an aperture.
9. Select true statements concerning the functions of filters.
10. Apply an exposure rule for different steps on the gray scale. (Assignment Sheet #1)
11. Set up a process camera and determine exposures. (Job Sheet #1)

LINE PHOTOGRAPHY
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Line copy – Any image composed of solid dark areas against a white background

B. Running water bath – Removes residual effects of film processing chemicals; makes the film more permanent

C. Normal copy – Copy with a good dense black image and white background

(NOTE: Normal copy is typically exposed so the negative will develop out to a solid 4 on the gray scale.)

D. Unusual copy – Copy that fits either extreme; extra heavy, light or extra light

(NOTE: Typically these categories of copy require exposures for developing the negative to different steps on the gray scale.)

E. Density – Lightness or darkness of a particular piece of copy

(NOTE: For graphic arts purposes, the density scale typically runs from 0 to 2.00; 0 being white and 2.00 being black.)

F. Reflection gray scale – Commercially produced strip of photographic paper stepped (usually 12) in increasing density values of .15 for each step

G. Photo factor – States that every exposure increase of .30 density requires a 2X exposure factor

H. Densitometer – Instrument for reading photographic densities

I. Resolving power – Ability of a lens or film emulsion to record fine detail

J. Emulsion – Light-sensitive coating on photographic materials

K. White light – Electromagnetic radiation having different wave lengths that produce different colors, such as red, green and blue

L. Color copy – Copy where the background and/or image is in a color other than black

INFORMATION SHEET

M. Filter – Colored device made commonly of gelatin or glass; placed in front of the lens to reduce or eliminate light of certain colors and allow the light of other colors to pass through onto the film for exposure

N. Filter factor – A number multiplied by the normal exposure to achieve the necessary exposure increase when using a filter

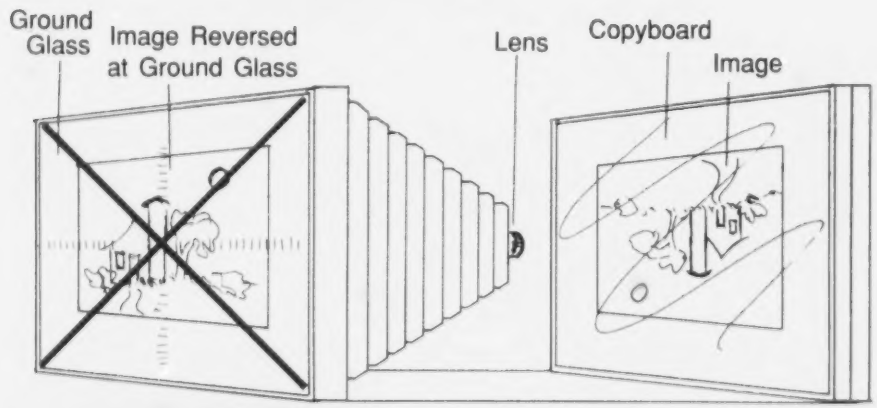
O. *F/*stop – The diameter of the lens opening

(NOTE: An "*F/*stop" represents a given lens opening according to its diameter in relationship to the distance from the film plane to the optical center of the lens when the lens is focused to infinity. The resulting numbers are a fraction: i.e. *f*/22 = an aperture diameter equal to 1/22 the distance from the film plane to the optical center of the lens. Changing the *f*/stop one increment up in numerical value therefore cuts the amount of light reaching the film in half: i.e. *f*/22 to *f*/32. Decreasing the *f*/stop number by one doubles the amount of light: i.e. *f*/8 to *f*/11.)

II. Principles of line photography (theory of photography)

A. Light rays travel in a straight line as they are projected through the lens of a camera.

B. An image must be placed in the copyboard upside down in order to be viewed right reading from the ground glass.



Resulting Negative

INFORMATION SHEET

C. When camera lights illuminate the copy in the copyboard, light copy areas reflect light and dark copy areas absorb light.

1. The reflected portion of the light passes through the lens and exposes the emulsion of the film creating a latent image.

2. The dark copy area does not record an exposure on the film, thus the image area shows up clear on the developed film.

III. Types of film base material

(NOTE: The film base constitutes 70-85% of the total film thickness.)

A. Non-stable base – Inexpensive material such as plastic or acetate; suitable for most line work where precise image registration requirements are not necessary

B. Dimensionally stable base – Very stable base material such as polyester; used for halftones and other critical work requiring precise image stability

IV. Type of emulsion

A. Orthochromatic – Sensitive to colors of the visible spectrum with the exception of red

B. Panchromatic – Sensitive to all colors of light in the visible spectrum

C. Blue-sensitive – Sensitive primarily to blue portion of the spectrum

(NOTE: This type of film is used extensively for film contacting operations as opposed to camera procedures.)

V. Degrees of density

A. Opaque – Blocks out all light

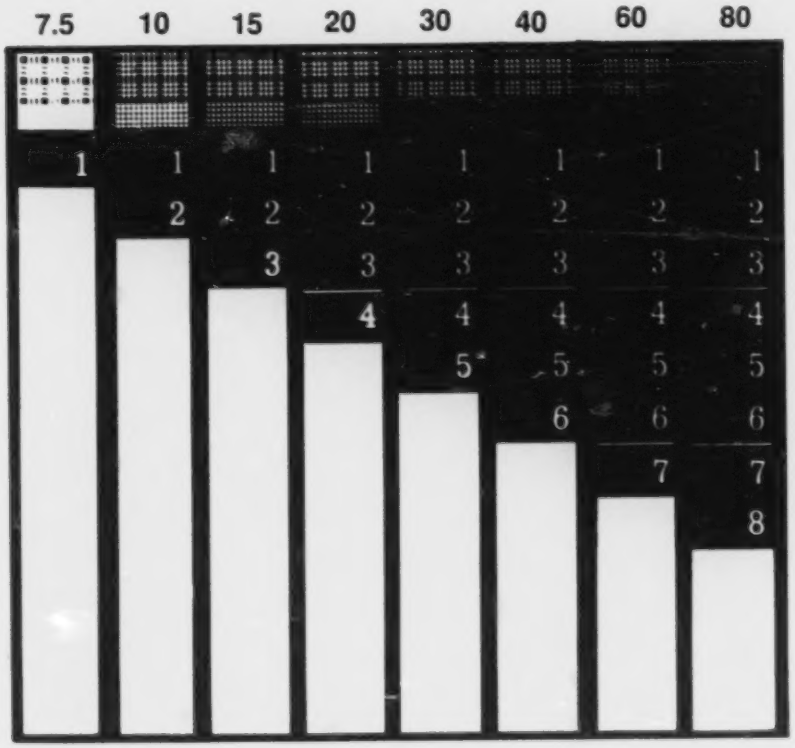
B. Translucent – Blocks out only a portion of the light

C. Transparent – Allows almost all light to pass through

(NOTE: A line negative should have a transparent image area and an opaque background or non-image area.)

INFORMATION SHEET

VI. **Exposure rule for recording density steps on a gray scale** – Every change in density of .30 (2 steps on the gray scale or 1*f*/stop) requires either twice or half as much exposure (depending on whether one is going up or down the scale.)



Developed Gray Scale

Courtesy Stouffer Graphic Arts Equipment Company

VII. **Parts of a typical lens assembly** (Transparencies 1 and 2)

A. Lens Shade and filter holder

B. *F*/stop adjustment lever

C. Lens elements

D. Aperture

E. Shutter

F. Electric solenoid

INFORMATION SHEET

VIII. Characteristics of an aperture

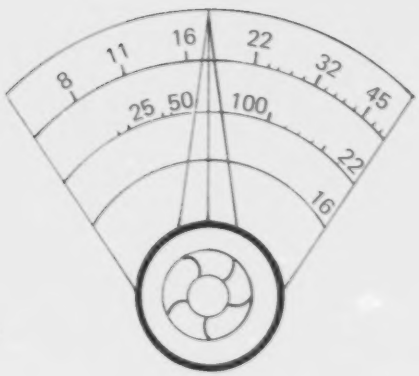
A. Located inside lens barrel

B. Made up of several metal blades that form a circular opening

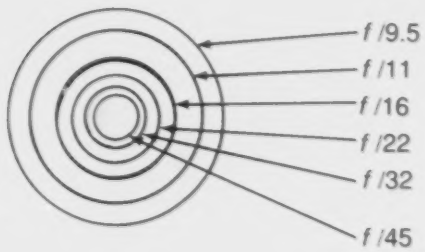
C. Controls quantity of light striking the film

D. A change in *f*/stop will change the aperture size

Example: Changing the *f*/stop to the next higher number will reduce the light by exactly one-half. Changing the *f*/stop to the next lower number will double the amount of light. To simplify this concept think of the *f*/stop as a fraction; 1/22 is a smaller fraction than 1/16. Thus *f*/16 will allow twice the amount of light to pass through the lens.



Aperture: Front View

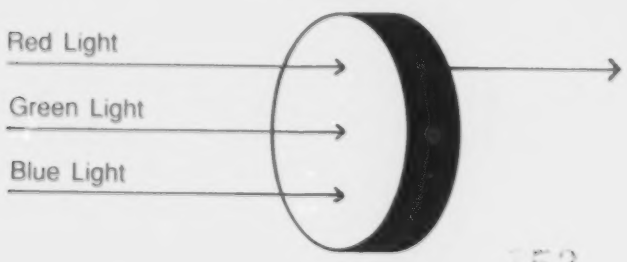


Relative Sizes of Aperture Openings

IX. Functions of filters

A. Allow light of the same color as the filter to pass through while holding back the other two color components of white light

Red Filter



INFORMATION SHEET

B. Used to drop a color in the final reproduction and therefore photograph copy as white

C. May be used to hold a color in the final reproduction and therefore photograph copy as black

(NOTE: The following table shows suggested film and filter combinations for photographing color copy.)

To Hold a Color		Color of Copy	To Drop a Color	
Orthochromatic	Panchromatic		Orthochromatic	Panchromatic
Orange (16)	Green (61,58)	Magenta	Blue (47B)	Red(25)
Blue (47B)	Blue (47B)	Red/Orange	N/R	Red (29)
Blue (47B)	Blue (47B)	Yellow	Orange (16)	Red (29)
Blue (47B)	Magenta (30)	Green	Orange (16)	Green (58)
N/R	Red (25)	Cyan	No filter needed	Blue (47B)
Orange (16)	Green (58)	Blue	Magenta (30)	Blue (47B)

LINE PHOTOGRAPHY
UNIT II

ASSIGNMENT SHEET #1—APPLY AN EXPOSURE RULE FOR DIFFERENT STEPS ON THE GRAY SCALE

Name _____ Overall Rating _____

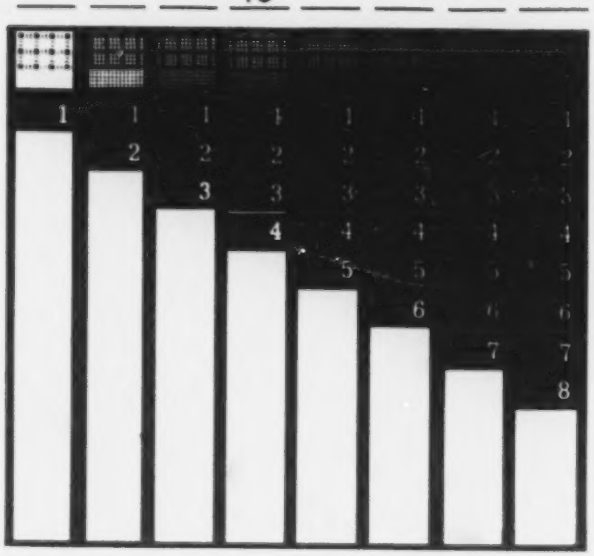
Evaluation Criteria	Rating
• Student followed directions	_____
• Student entered correct exposures	_____

Introduction: In order to compensate for many different types of copy typically shot on a process camera, the camera operator must have an understanding of the effects of exposure in relation to the steps on a photographic gray scale.

Directions: Write the necessary exposures on the lines at the top of each scale. In each case, the exposure is given that would yield a solid step 4 on the gray scale.

A.

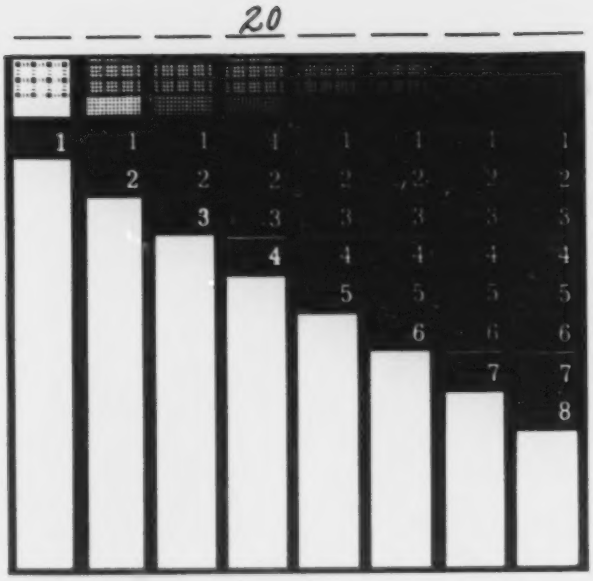
___ ___ ___ 16 ___ ___ ___ ___



Courtesy Stouffer Graphic Arts Equipment Company

ASSIGNMENT SHEET #1

B.



Courtesy Stouffer Graphic Arts Equipment Company

LINE PHOTOGRAPHY
UNIT II

JOB SHEET #1—SET UP A PROCESS CAMERA AND DETERMINE EXPOSURES

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Student correctly determined basic exposure based on a solid step 4 on the gray scale	_____
• Correctly completed exposure chart for variations in size and quality based on basic exposure	_____

Introduction: A process camera operator must be able to determine exposure on a wide variety of "originals," therefore must be able to understand and operate the process camera, making proper adjustments in exposure based on size and quality of original copy. This exercise will give the student experience in the use of the process camera.

(NOTE: The instructor may also use this job sheet to illustrate examples in the areas of filters, reductions, enlargements, and problem copy.)

I. Equipment and materials

A. Process camera

B. 12-step reflection gray scale

C. 10-power magnifier

D. Darkroom timer

E. Squeegee

F. Graphic arts film

JOB SHEET #1

II. Procedure

A. Prepare darkroom

B. Set up camera and determine basic exposure.

1. Make sure the copyboard is clean.

   (NOTE: Use an approved graphic arts glass cleaner.)

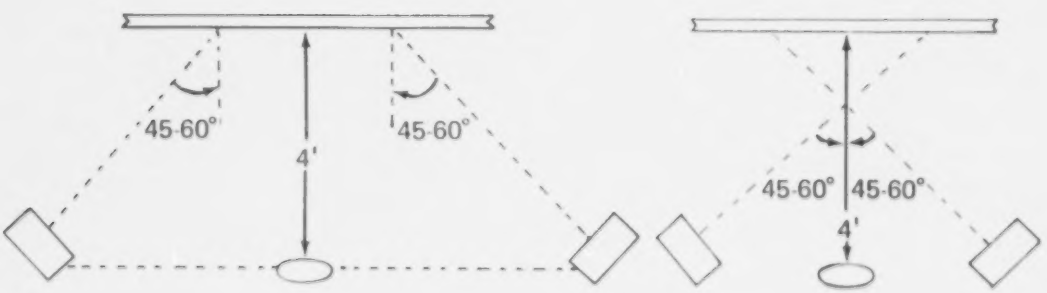
2. Make sure the lens is clean by visual observation.

   (NOTE: DO NOT ATTEMPT TO DISASSEMBLE or clean the lens. If it is necessary to clean the lens, ask your instructor.)

3. Position camera lights to give more illumination to the four corners of the copyboard than to the center. (Figure 1)

   (NOTE: The angle formed by an imaginary line from lens to copyboard and the camera lights will vary on cameras, but will generally fall between 45 and 60 degrees.)

FIGURE 1



Courtesy Eastman Kodak Company

4. Adjust camera lights to avoid any direct reflection from the glass of the copyboard.

5. Make sure the lens is not reached by any light source other than camera lights.

   (NOTE: The lens and film must be protected from lights that are not part of the image, such as room light, window light, reflected light from bright objects, or misplaced copy lights. These nonimage lights will cause flare and degrade the quality of the negative. A lens hood is usually effective.)

JOB SHEET #1

6. Select samples of the following line copies:

   a. Phototypeset

   b. Typewriter

   c. Line illustrations

7. Fasten small strips of the line copies on a cardboard.

8. Place copyboard in the horizontal position and raise the glass cover.

9. Place the sample copies on the center of the copyboard.

10. Place a 12-step reflection gray scale next to the copy on the copyboard and close the copyboard.

11. Return copyboard to vertical position.

12. Use a lens opening of *f*/22 for the test exposure.

13. Set the camera controls on 100% (same size) reproduction.

14. Set the camera timer to make a 10 second exposure.

15. Place a sheet of graphic arts film on the center of the camera back with the emulsion side up.

    (NOTE: Always handle film by the edges.)

16. Turn on the vacuum and close the camera back.

17. Make an exposure by starting the timer.

18. Turn the vacuum off and remove the film.

19. Set the darkroom timer for recommended development time (usually 2:30 - 2:45).

20. Start the timer and drag the film emulsion side down through the developer and then quickly flip it over.

    (NOTE: Agitate the developer continuously by raising the left side of the tray and lowering it, then raising the right side of the tray and lowering it, then raising the front of the tray and lowering it. Continue this procedure until the time has elapsed.)

21. Remove film from developer and hold it on top of tray to drain for approximately 5 seconds.

22. Place film in stop bath quickly and agitate vigorously for approximately 15 seconds.

JOB SHEET #1

23. Place film in fixer and agitate for approximately 2 minutes or twice the length of time it takes for the image area to clear.

24. Wash film for recommended time.

    (NOTE: For this test exposure, simple rinsing will be sufficient.)

25. Squeegee the film and hang it to dry.

26. Place the negative on a light table and examine the gray scale.

    EXAMPLES: A black step 4 indicates that the negative is probably good. The negative area is either clearly transparent or densely opaque. The edges of the letters are sharp and details are true to the original. See gray scale #1 in Figure 2.

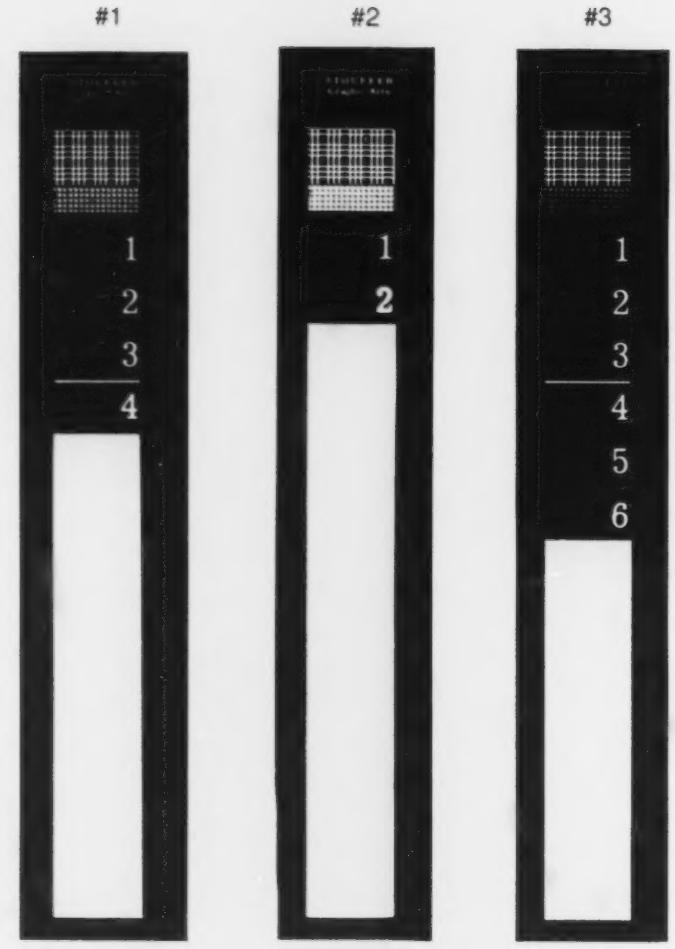
    A black step 3 or lower indicates that the negative is underexposed. Although the clear areas are transparent, the opaque areas have low density and many pinholes, and details are thicker than the original. See gray scale #2 in Figure 2.

    A black step of 5 or higher indicates that the negative is overexposed. Although dense areas are opaque, density appears in some areas that should be clear and the type shows loss of fine details. See gray scale #3 in Figure 2.

    (NOTE: When checking quality of image on the negative always use a magnifier and compare the same area or character on the original copy and the negative.)

JOB SHEET #1

FIGURE 2



Courtesy Stouffer Graphic Arts Equipment Company

27. Adjust exposure if necessary.

(NOTE: Although in the example, 10 seconds gave a solid step 4, it should be pointed out that 10 seconds is not the magical number that works in all situations. The combination of the camera, lighting system, film and developer all affect the exposure/development process. It is important to remember that the exposure may be adjusted to give the required step 4 on the gray scale.)

C. Calculate exposure changes required for variations in copy size and quality.

(NOTE: Although a solid 4 on the gray scale may indicate a desirable exposure for normal copy, other types of copy may be exposed for one or two steps less than 4 or some copy may be exposed for one, two, or three steps more than 4. Two factors that determine how copy is exposed are quality of the original copy and the size of reproduction of the original copy.)

1. Study the completed chart in Figure 3.

(NOTE: In order to interpret the chart, locate 4 black located horizontally with NORMAL COPY and vertically with 40-120% The normal exposure in this example is 20 seconds for a solid 4. To interpret the rest of the chart, simply remember the concept, every 2 steps on the gray scale equal twice or one-half as much exposure depending on whether the scale is reading up or down.)

JOB SHEET #1

FIGURE 3

Density of Copy	Size of Copy		
	10-40%	40-120%	120-400%
EXTRA HEAVY COPY			
Black bold type Etching proofs Photo proofs	4 Black 20 sec.	5 Black 30 sec.	6 Black 40 sec.
NORMAL COPY			
Good black type proofs with fine serfs Pen and ink drawings Printed forms	3 Black 15 sec.	4 Black 20 sec.	5 Black 20 sec.
LIGHT COPY			
Gray copy Ordinary typewritten sheets Printed forms/light lines Good pencil drawings	2 Black 10 sec.	3 Black 15 sec.	4 Black 20 sec.
EXTRA LIGHT COPY			
Extra fine lines Pencil drawings Extra light gray copy	1-2 Black 8 sec.	2 Black 10 sec.	3 Black 15 sec.

Courtesy Stouffer Graphic Arts Equipment Company

2. Check the test negative that you made for the basic main exposure (that exposure which gives a solid step 4 on the gray scale).

3. Write your basic main exposure under **4 black** opposite **normal copy** in the blank chart (Figure 4).

4. Complete the chart by applying the exposure rule.

JOB SHEET #1

FIGURE 4

Density of Copy	Size of Copy		
	10-40%	40-120%	120-400%
EXTRA HEAVY COPY Black bold type Etching proofs Photo proofs	4 Black	5 Black	6 Black
NORMAL COPY Good black type proofs with fine serfs Pen and ink drawings Printed forms	3 Black	4 Black	5 Black
LIGHT COPY Gray copy Ordinary typewritten sheets Printed forms/light lines Good pencil drawings	2 Black	3 Black	4 Black
EXTRA LIGHT COPY Extra fine lines Pencil drawings Extra light gray copy	1-2 Black	2 Black	3 Black

Courtesy Stouffer Graphic Arts Equipment Company

5. Clean work area; return equipment and materials to proper storage.

HALFTONE PHOTOGRAPHY
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to set up a process camera to do the following halftone procedures: make a halftone negative, make a fake duotone, make a duotone and rescreen a halftone illustration. Competencies will be demonstrated by completing the assignment sheet, job sheets, and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to halftone photography with their correct definitions.
2. Match types of contact screens with their descriptions.
3. Select true statements concerning the care of contact screens.
4. Complete statements concerning halftone dot percentages.
5. Select true statements concerning procedures for avoiding moires in rescreening.
6. Identify halftone dot percentages. (Assignment Sheet #1)
7. Program a Q15 exposure computer and make a halftone negative. (Job Sheet #1)
8. Make a duotone. (Job Sheet #2)
9. Make a fake duotone. (Job Sheet #3)
10. Rescreen a halftone illustration. (Job Sheet #4)

HALFTONE PHOTOGRAPHY
UNIT III

INFORMATION SHEET

I. Terms and definitions

A. Halftone — A converted image of a continuous tone copy that consists of solid dots of equal density but varying sizes

B. Halftone screen — Used in the light path between the lens and film to break the continuous tone copy into a dot pattern for reproduction

(NOTE: There are two classifications of halftone screens, glass screens and contact screens, but only the contact screen will be discussed and used in this section.)

C. Contact screen — A precision pattern of vignetted dots on a flexible base material used in direct contact with the film

D. Screen ruling — The number of lines per inch on a halftone screen

(NOTE: Higher number screen rulings will reproduce finer details. Screen rulings range from 65 to 300 lines, with the most common rulings being 65, 85, 100, 120, 133, and 150 lines.)

E. Density — A numerical measure of the blackening or light-stopping ability of a photographic image

F. Densitometer — An instrument for making density measurements

G. Main exposure — A detail exposure made through the lens of the camera, with the contact screen in place with only the camera lights

H. Flash exposure — A nonimage exposure made through the contact screen to the film; used to increase dot size in the shadow area of the halftone

I. No-screen exposure — An exposure made by exposing the film to the copy without the contact screen

(NOTE: The no-screen exposure is also called *highlighting* or *bump exposure*.)

J. Neutral density filter — A gray-colored filter used to uniformly reduce all colors of light

(NOTE: Neutral density filters are also referred to as *ND filters* and are typically used with a bump exposure.)

K. Halftone dot — An individual dot of printed ink; groups of dots represent percentage of ink coverage on the printed sheet

(NOTE: Percentage of ink coverage varies drastically from the highlight to the shadow.)

INFORMATION SHEET

L. Duotone — A two-impression reproduction using two halftones of the same original

(NOTE: One halftone is normally black and the other is another color. However, both halftones may be black. The screen angle of the halftones must be 30° apart.)

M. Fake duotone — A two-impression reproduction, with a halftone which is overprinted on a color block

(NOTE: A fake duotone is also called a *duograph*.)

N. Moire — An objectionable wavy effect produced when screens are overprinted at an incorrect angle

O. Rescreening — Screening of a printed halftone illustration

II. **Types of contact screens and their descriptions** (Transparency 1)

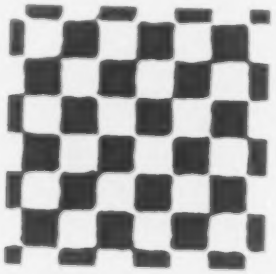
(NOTE: Transparency 1 shows the way the contact screen breaks up light reflected from the copy and creates dots of varying sizes on the emulsion of the graphic arts film.)

A. Gray contact screen — A silver emulsion screen that does not require magenta color for control of tone reproduction

(NOTE: This is the most popular and easiest screen to use. A controlled flash exposure is recommended for adjusting halftone contrast.)

B. Magenta contact screen — A dyed screen whose tone reproduction characteristics can be altered with the use of magenta and yellow filters

C. Conventional dot screen — A screen that produces square middletone dots that join all four corners as the dots reach 50 percent

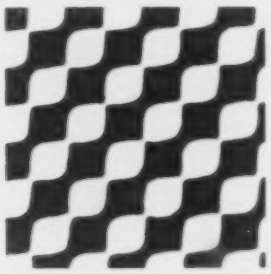


Conventional (Square) Dots

Courtesy Eastman Kodak Company

INFORMATION SHEET

D. Elliptical dot screen — A screen that produces football-shaped middletone dots that join only two opposite corners as the dots reach 50 percent



Elliptical Dots

Courtesy Eastman Kodak Company

III. Care of contact screens

A. Protect screens from dirt, dust, fingerprints, scratches, and other damage.

B. Keep the screen flat and in its original folder when not in use.

C. Dust the screen when necessary by wiping it lightly with a clean dry photo chamois.

D. Clean water spots only with film cleaner.

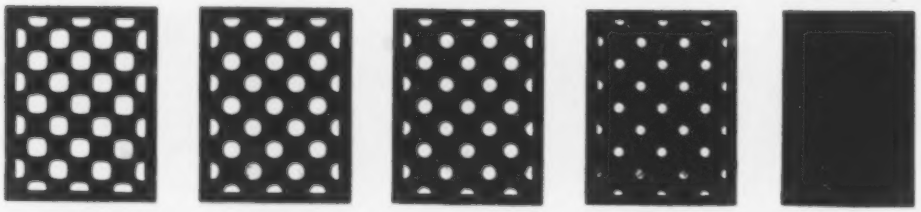
IV. Halftone dot percentages

A. Halftone dots are described in terms of percentage of ink coverage on the printed page.

(NOTE: The following illustration shows the various halftone dot percentages used to reproduce a typical range of tones found on a continuous-tone photograph.)

INFORMATION SHEET

10% 20% 30% 40% 50%



60% 70% 80% 90% 100%

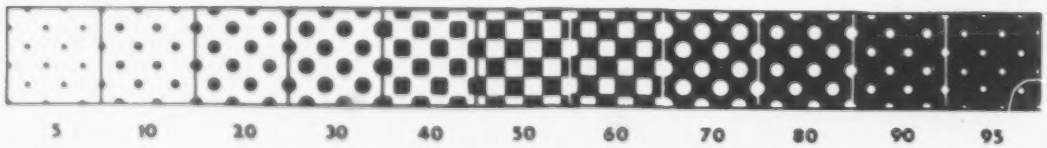
Courtesy Eastman Kodak Company

B. Dot percentages as they appear on the printed page are exactly opposite of how they appear on the halftone negative.

Highlight Shadow

Appearance of Dots on a Halftone Negative

Highlight Shadow



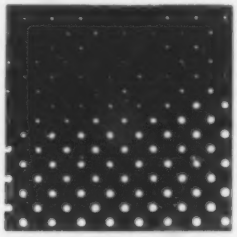
Appearance of Dots on the Printed Page

Courtesy Eastman Kodak Company

INFORMATION SHEET

C. The highlight area of a halftone typically prints 10 percent ink coverage with 90 percent white reflected from the page, thus the eye sees primarily white.

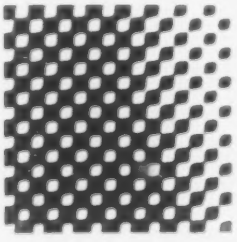
(NOTE: The facsimile of the negative section shown in the example below shows the size of typical highlight dots as they would appear on the halftone negative. The dense black area contains small clear openings. Highlight dots typically range from a small pinpoint dot to a 10 percent dot.)



Courtesy Eastman Kodak Company

D. The middletone areas appear to be gray because the 50 percent ink coverage and 50 percent white reflected from the page are blended by the eye.

(NOTE: The facsimile of the negative section shown in the example below shows the size of middletone dots as they would appear on the halftone negative. Middletone dots typically range from 40 to 60 percent with a 50 percent dot being the actual dot used for middletone identification purposes.)

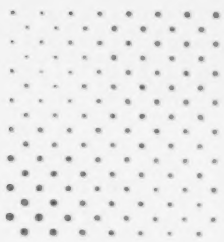


Courtesy Eastman Kodak Company

E. The shadow area of a halftone typically prints 90 percent ink coverage with only 10 percent white reflected from the page, thus the eye sees primarily black in the shadow area of a printed halftone.

(NOTE: The facsimile of the negative section shown in the following example shows the size of shadow dots as they would appear on the halftone negative. The shadow dot area has the least amount of density in the halftone negative with only small black dots appearing. Shadow dots typically range from 90 percent down to the smallest printable dot, which is usually about 95 to 98 percent.)

INFORMATION SHEET



Courtesy Eastman Kodak Company

F. Quarter-tone dots bridge the highlight to the middletone dots and typically range from 20 to 30 percent, while three-quarter tone dots bridge the middletone to the shadow area and typically range from 70 to 80 percent.

V. Procedures for avoiding moires in rescreening

(NOTE: Making a halftone negative from a printed halftone illustration may cause a moire.)

A. Angle the contact screen or copy 30 degrees.

B. Use a magnifier while viewing the image on the ground glass and adjust the copyboard control to make a slight shift in focus that will blur the halftone dots.

(NOTE: If done correctly, this procedure causes the existing halftone dots to be rescreened without a moire. The out of focus halftone dots have little or no effect on the overall photo illustration.)

C. Use a screen which has a screen ruling of 50 lines coarser or finer than the copy.

D. Hold a clean piece of glass in front of the lens, and tilt it back and forth during exposure.

E. If size requirements permit, original may be reduced to less than 40 percent.

HALFTONE PHOTOGRAPHY
UNIT III

ASSIGNMENT SHEET #1—IDENTIFY HALFTONE DOT PERCENTAGES

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student circled correct areas of halftone	_____

Introduction: In order to produce halftone images according to industry standards, you must be able to identify halftone dot sizes that represent important control points (highlight, middletone and shadow) in the reproduction of halftones.

Directions: Use the enlarged section of the printed halftone image on the next page to identify a 10 percent highlight dot, a 50 percent middletone dot and a 90 percent shadow dot. Circle the area you choose to represent each dot area, then draw a line out into the margin of the page and write the dot percentage.

(NOTE: Have someone hold up the photo illustration while you look at it. Turn around and walk away 25 feet or so, then look at the photo illustration again. What you will see is the difference between looking at halftone dots by using a magnifier versus what you typically see when you look at a picture on the printed page.)

ASSIGNMENT SHEET #1

Halftone photo illustration by John Koonce

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HALFTONE PHOTOGRAPHY
UNIT III

JOB SHEET #1—PROGRAM A Q15 EXPOSURE COMPUTER AND MAKE A HALFTONE NEGATIVE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom was prepared correctly including chemical temperature and processing times	_____
• Halftone negative properly exposed and developed to yield a 5-10 percent highlight dot and a 90-95 percent shadow dot.	_____

Introduction: Although many firms are bypassing process cameras in favor of sophisticated "computer to plate" technology, many printshops will be using process cameras for years to come. This exercise will allow the student to begin basic process camera work to produce a halftone negative.

A. Equipment and materials

1. Kodak Q15 Exposure Computer
2. Kodak 24 Step Reflection Density Guide, Q16
3. Reflection densitometer (optional)
4. Magnifier (10X)
5. Contact screen
6. Litho film (8 × 10 or 10 × 12)
7. A continuous tone copy with normal contrast (a good black and white photograph)
8. Process camera and other darkroom equipment

JOB SHEET #1

B. Procedure

1. Make the test negative.

   a. Set up darkroom and stabilize temperature.

   b. Set up camera for a 100% reproduction.

      1) Set *f*/stop on *f*/16.

      2) Set timer.

         (NOTE: Use an exposure of approximately three times the normal exposure for a line negative. In this example we will use 30 seconds.)

   c. Place a Kodak Refection Density Guide (24 step) on the camera copyboard.

   d. Place a sheet of 8 × 10 or 10 × 12 inch film that is normally used for halftone on the camera back.

   e. Cover up approximately one inch of the edge of the film widthwise with a piece of cardboard and tape it down.

   f. Place a contact screen, emulsion side down, over the film.

      (NOTE: To ensure good contact, the screen must be at least ½ inch larger than the film on all four sides.)

   g. Wipe the contact screen lightly with a photo chamois or rubber roller to work air bubbles out.

   h. Make an exposure and open the camera back.

      (**NOTE: Do not turn the vacuum off.**)

   i. Uncover the covered area and cover the exposed area of the film with the contact screen in place.

   j. Make a series of flash exposures.

      (NOTE: Use a second piece of cardboard to step off a series of at least five 5-second exposures by moving the cardboard ½ inch each time.)

   k. Remove the contact screen and place it in its original container.

   l. Process the test negative.

      (NOTE: All processing must be kept absolutely consistent.)

JOB SHEET #1

m. Place the negative on a light table and examine the dot structure with a magnifier.

(NOTE: The normal highlight dots should fall on step .00 or higher density of the gray scale. If they do not, another exposure must be made by doubling the exposure. Ask your instructor what the normal highlight dots should be. There will be no dots in the areas of the negative that represent the darkest steps of the gray scale, but dots do appear in lower density steps (shadow dots). Select the normal highlight and shadow dot, and note the density of the corresponding steps. In this example we will use the hypothetical numbers of .20 for highlight and 1.30 for shadow. Students should use the actual steps that produced the normal highlight and shadow dots.)

n. Examine the flash exposures on the edge of the test negative, and select the step which produced a normal shadow dot.

(NOTE: These dots should be the same size as the shadow dot on the gray scale.)

o. Record the exposure time which produced this dot.

(NOTE: This flash time becomes the basic flash exposure. If none of the steps show acceptable dot sizes, change the flash lamp distance and/or size of the bulb and repeat the process. In this example we will assume the 20-second step produced a normal shadow dot.)

2. Program the computer.

a. Select the quadrant of the basic flash dial (clear) that corresponds with the basic flash exposure.

(NOTE: In this example it is 20 seconds.)

b. Cover all but the correct quadrant with the mask wheel.

c. Rotate the main exposure dial (M) until it is in line with the density of copy that produced the highlight dot.

(NOTE: In this example it is .20.)

d. Set "zero" of the basic flash quadrant opposite the density of gray scale that produced the shadow dots.

(NOTE: In this example it is 1.30.)

e. Secure the basic flash dial, mask wheel, and main exposure dial with a piece of tape, making sure the alignment has not changed.

JOB SHEET #1

f. Rotate the main exposure calibration tab so that the test negative exposure time appears in the window and is in line with the density that produced the highlight dots.

(NOTE: In this example it is 30 seconds.)

g. Fasten the tab to the base of the computer; the computer is now programmed.

3. Use the computer with gray contact screen and Kodalith Autoscreen.

a. Obtain the highlight and shadow densities of the copy.

(NOTE: Use a Kodak Reflection Density Guide or a reflection densitometer. In this example we will use a highlight density of .25 and shadow density of 1.55. Students should use the actual densities of the copy.)

b. Rotate M to the highlight density of the copy.

c. Set pointer F at the shadow density of the copy.

d. Select the red correction arrow which is closest to pointer F.

e. Move pointer F to the head of the correction arrow.

f. Rotate the flash quadrant dial the length of the arrow.

g. Reset F at the copy shadow density.

h. Read the main exposure time in the window.

i. Read the flash exposure time at pointer F.

(NOTE: In this example, the main exposure is 33 seconds and the flash exposure is 6 seconds.)

4. Use the computer with a magenta contact screen.

a. Obtain the highlight and shadow density of the copy.

b. Rotate M to the highlight density of the copy.

c. Set pointer F at the shadow density of the copy.

d. Read the main exposure time in the window.

e. Read the flash exposure time at pointer F.

(NOTE: Do not use correction arrows when using magenta contact screens.)

JOB SHEET #1

5. Program the computer for no-screen (bump) exposure.

   a. Make a second test negative with the same contact screen, same film, and same exposure.

      (NOTE: Do not turn the vacuum off.)

   b. Remove the contact screen.

      (NOTE: This should be done carefully so the film does not move.)

   c. Make a second exposure on the same piece of film.

      (NOTE: If a gray contact or magenta negative screen is used, the exposure time should be 5 percent of the exposure for the first test negative. If a magenta positive screen is used, the exposure time should be 10 percent. In this example we assume 5 percent. The first test negative had a 30 second exposure. Five percent of 30 seconds is 1½ seconds. If the process camera is not equipped with an accurate timer, a neutral density filter should be used. Ask the instructor for the proper value.)

   d. Process and dry the negative.

   e. Locate the step on the gray scale that produced a suitable highlight dot only.

      (NOTE: The highlight dot will be in a higher density step; assume it is .45.)

   f. Determine the difference between the density of the step that produced the highlight dot in test negative No. 1 and test negative No. 2.

      (NOTE: In this example .45 – .20 = .25.)

   g. Refer to the no-screen calibration table on the back of the computer.

      (NOTE: For convenience, the numbers from one of the vertical columns of the table will be transferred to the no-screen scale of the computer. To determine which column to use, read down the left-hand side of the table to the density difference. Read across to the percentage of no-screen exposure that was used.)

   h. Read down the left-hand side of the table (highlight difference) to the density difference (Figure 1).

JOB SHEET #1

i. Read across to the percentage of no-screen exposure that was used (Figure 1).

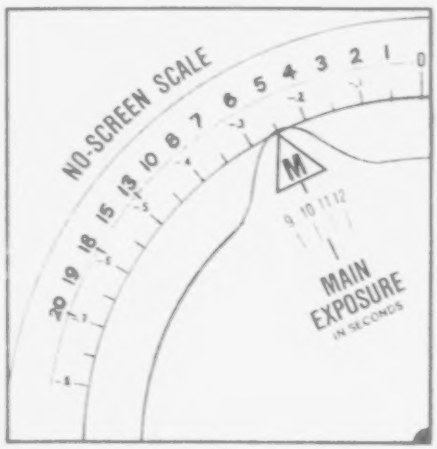
(NOTE: Where these two figures intersect [Figure 1], transfer the numbers from this column to the front of the computer opposite their density equivalents on the no-screen scale [Figure 2]. The computer is now calibrated for no-screen exposure.)

FIGURE 1

NO-SCREEN CALIBRATION TABLE

Highlight Difference	Percentage No-Screen Exposure							
05	2	2	1	1	1	1	1	0
10	4	3	3	2	2	2	2	1
15	7	[5]	5	4	4	3	3	2
20	10	8	7	[5]	5	4	4	3
25	14	10	8	7	6	[5]	5	4
30	20	13	10	8	7	6	6	5
35		16	12	10	8	7	7	6
40		20	15	13	10	8	8	7
45			18	15	13	10	9	8
50			20	18	15	13	10	9
55				19	18	15	13	10
60				20	19	18	15	13
65					20	19	18	15
70						20	19	18
75							20	19
80								20

FIGURE 2



Courtesy Eastman Kodak Company

6. Use the computer for no-screen exposures.

a. Select the areas of the copy where a highlight and shadow dot should be placed.

(NOTE: In this example we assume a highlight density of .10 and shadow density of 1.65.)

b. Rotate M to the percentage of no-screen exposure to be used for that copy (Figure 2).

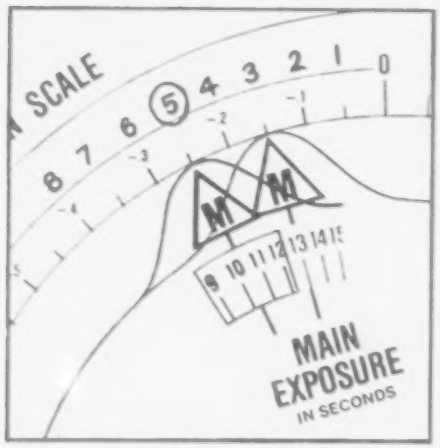
(NOTE: In this example it is 5.)

JOB SHEET #1

c. Rotate M clockwise the distance of the highlight density of the copy (Figure 3).

(NOTE: Do not rotate M if the highlight density of the copy is .00.)

FIGURE 3



Courtesy Eastman Kodak Company

d. Read the main exposure in the window (Figure 3).

(NOTE: In this example it is 13 seconds.)

e. Set Pointer F at the shadow density.

(NOTE: Correction arrows are not used. The exposure times for this copy will be:

Main exposure — 13 seconds
No-screen exposure — 13 seconds with a 1.30 ND filter
Flash exposure — 17 seconds.)

f. Using the above procedures, make a halftone negative.

g. Evaluate the negative and show it to the instructor.

h. Clean work area and return equipment and materials to proper storage.

HALFTONE PHOTOGRAPHY
UNIT III

JOB SHEET #2—MAKE A DUOTONE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Proper exposure determination and film processing for duotone negatives used to give proper dot percentages	_____
• Color proof of duotone showed adequate contrast, was in register and colors were shown in proper sequence when mounted on card stock	_____

Introduction: Duotones are a useful printing product to provide customers a striking printing job at a lower cost than four-color printing. This exercise allows the student to gain experience in exposing duotone negatives and making proofs of them.

A. Equipment and materials

1. Process camera
2. Darkroom equipment
3. Contact screen
4. Continuous tone copy
5. Halftone film
6. Register marks
7. A sheet of index or chipboard (larger than copy)
8. Black photographic tape (black masking tape)
9. Color key or other color proofing material and developer
10. Protractor and ruler

B. Procedure

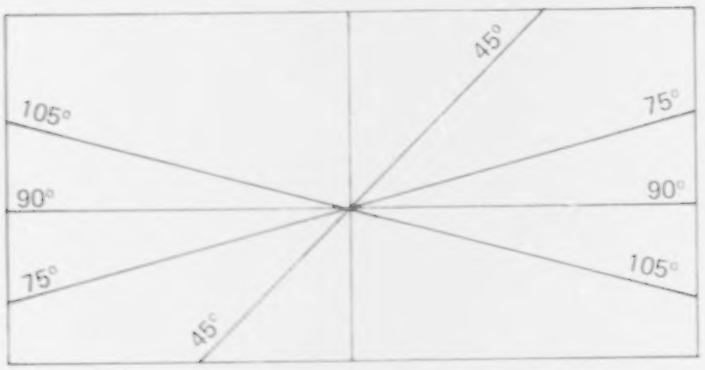
1. Make a template for angling copy on the index or chipboard (Figure 1).
   a. Draw a vertical line through the center of chipboard, and mark this line 0°.
   b. Place zero line of the protractor on this line and mark off 45°, 75°, 90°, and 105°.

JOB SHEET #2

c. Draw lines from these points through the center of the zero line to the edge of the chipboard.

(NOTE: Only 45° and 75° lines will be used in the job sheet. However, this template should be saved for use in rescreening and in the color separation unit.)

FIGURE 1



2. Make a duotone

a. Place register marks on the copy.

(NOTE: Place at least two of them at opposite ends of the copy. If they can not be placed on the copy, mount the copy on a larger board.)

b. Mark the centerline of the copy at both top and bottom.

(NOTE: These lines will be used to line up the copy with the lines on the chipboard.)

c. Tape the copyboard mat down securely to the metal copyboard frame.

d. Tape the chipboard securely to the center of copyboard mat.

e. Place the copy in the center of chipboard, and line it up with the 45° line.

f. Tape the copy down securely.

g. Set the camera to required size.

h. Position the contact screen as straight as possible on the vacuum back where it would normally go.

i. Place strips of black photographic tape as guides at the corner edges of the screen.

JOB SHEET #2

j. Determine what size film is needed.

(NOTE: Since the copy is angled on the copyboard, a larger sheet of film is required.)

k. Place tape guides on the vacuum back to guide the film in position.

l. Make the exposure and process the film.

(NOTE: Refer to Job Sheet #1 in this unit. This should be basically a normal negative. A 15 to 20 percent flash exposure is added to keep shadows from printing solid black.)

m. Open the copyboard slowly and rotate the copy to line up with the 75° line.

n. Tape the copy down securely and gently close the copyboard.

o. Place another sheet of film in the same position as before.

p. Position screen in exactly the same position as before.

q. Expose and process the film.

(NOTE: Reduce the main exposure by 10 to 20 percent and eliminate the flash. The result should be a flat-looking halftone in the highlight area, and little or no dots in the shadows.)

r. Register the two negatives.

(NOTE: If the negatives cannot be registered, or if there is evidence of a moire, carefully review the steps and ask the instructor for help. If the negatives do register and have no evidence of moire, ask the instructor if it should be proofed. To proof a duotone continue with steps below.)

s. Make a color proof of the black negative (45°) on a sheet of color key or other proofing material.

t. Make a contact proof of the color negative on a sheet of color key or other proofing material.

u. Process, wash, and dry the proofs.

v. Register the two proofs and tape them down. Be sure to put the color proof on the bottom and the black proof on top.

w. Clean work area and return equipment to proper storage.

HALFTONE PHOTOGRAPHY
UNIT III

JOB SHEET #3—MAKE A FAKE DUOTONE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Proper exposure given to provide appropriate dot percentages in halftone negative	_____
• Technique used in color proofing provided good register, appropriate color balance and no signs of a moire between halftone and screen tint	_____

Introduction: Duotones are a useful printing product to provide customers a striking printing job at a lower cost than four-color printing. This exercise allows the student to gain experience in manipulating process to render a duotone.

A. Equipment and materials

1. Process camera
2. Darkroom equipment
3. Contact screen
4. Halftone film
5. Register marks
6. Illustration board
7. Masking film
8. Paste-up and stripping equipment
9. Masking tape

B. Procedure

1. Mount the copy to the illustration board using masking tape.
2. Cut a piece of masking film large enough to extend ½ inch beyond the copy on all four sides.
3. Cut a straight line ½ inch down from the top of the masking film.

   (NOTE: Do not cut through the support base.)

JOB SHEET #3

4. Remove the emulsion from the top strip.

5. Apply two register marks in diagonal corners of the copy on the illustration board.

6. Place the masking film on the copy and fasten down with a strip of masking tape across the top.

   (NOTE: Make sure the clear part of the masking film extends into the copy about 1/16 inch or less.)

7. Draw the masking film down tightly and fasten the two lower corners.

8. Cut around the edge of the copy just inside the borders.

9. Peel off the masking film from all areas of the copy except the area covering the illustration.

10. Slide a sheet of white opaque paper under the masking film to cover the copy but not the register marks.

11. Set the camera to the required size and photograph this as a line copy.

    (NOTE: Use the same type of film that is to be used for halftone. The dimensional stability of film bases vary. Using two types of film could result in lack of registration.)

12. Process the film.

    (NOTE: This negative will be used for the solid or tint block to be laid under the halftone.)

13. Open the copyboard slowly, being careful not to jar the camera out of focus.

14. Remove the two pieces of masking tape from the lower corners of the overlay.

15. Swing the overlay back exposing the copy.

    (NOTE: Make sure the register marks are not covered and leave the overlay attached to the illustration board.)

16. Carefully close the copyboard.

17. Place a sheet of halftone film on the vacuum back.

18. Position the screen as straight as possible on top of the film.

19. Make a normal halftone negative.

    (NOTE: Refer to Job Sheet #1.)

20. Register the two negatives to see if they fit properly.

    (NOTE: The screen tint used for the second color must be angled 30° away from the angle of the halftone negative to prevent a moire.)

JOB SHEET #3

21. Make a color proof of the black negative (45°) on a sheet of color key or other proofing material.

22. Make a contact proof of the color negative on a sheet of color key or other proofing material.

23. Process, wash and dry the proofs.

24. Register the two proofs and tape them down. Be sure to put the color proof on the bottom and the black proof on top.

25. Clean work area and return equipment and materials to proper storage.

HALFTONE PHOTOGRAPHY
UNIT III

JOB SHEET #4—RESCREEN A HALFTONE ILLUSTRATION

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom and camera properly set up for rescreening halftones	_____
• Halftone rescreened and checked for lack of moire	_____

Introduction: This exercise will give the student an opportunity to make a halftone screen from an existing halftone with a minimum of moire.

A. Equipment and materials

1. Process camera
2. Darkroom equipment
3. Contact screen
4. Halftone illustration
5. Halftone film
6. Magnifier
7. Template for angling copy (refer to Job Sheet #2)

B. Procedure

(NOTE: Several methods are used for rescreening. In this job sheet the copy will be angled at 30°. Ask the instructor if other methods should also be used.)

1. Find the screen angle of the illustration.

   (NOTE: Use a screen angle finder or magnifier.)

2. Place the template on the copyboard.

   (NOTE: This template was made in Job Sheet #2.)

3. Place the illustration on the center of the template.
4. Angle the illustration 30° from its screen angle and fasten it to the template.
5. Make a normal halftone.

   (NOTE: Make sure the contact screen is straight on the vacuum board.)

JOB SHEET #4

6. Process and dry the negative.

7. Examine the negative for the presence of moire.

   (NOTE: If there is moire in the negative, check the procedures and remake the negative.)

8. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to do a variety of related camera/darkroom tasks to include line, halftone and posterization techniques using diffusion transfer material; posterization techniques using film and contacting procedures. Competencies will be demonstrated by completing the job sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to darkroom techniques with their correct definitions.
2. Select true statements concerning the care of a diffusion transfer processor.
3. List materials and equipment necessary to make a diffusion transfer print.
4. Determine basic exposure and make a diffusion transfer line print. (Job Sheet #1)
5. Program a Q15 Exposure Computer and make a diffusion transfer halftone print. (Job Sheet #2)
6. Make a two-tone posterization using diffusion transfer material. (Job Sheet #3)
7. Make a three-tone posterization using special effects screen and diffusion transfer material. (Job Sheet #4)
8. Make a three-color posterization using graphic arts film. (Job Sheet #5)
9. Make a duplicate negative and a film positive using graphic arts film. (Job Sheet #6)
10. Make a spread and a choke using graphic arts film. (Job Sheet #7)
11. Make a combination print with reversed type overprinted in a second color. (Job Sheet #8)

OTHER DARKROOM TECHNIQUES
UNIT IV

INFORMATION SHEET

I. **Terms and definitions**

A. Diffusion transfer — A photographic process characterized by exposing a sheet of sensitized paper, processing the paper in contact with a receiver sheet, and peeling the two apart after a short waiting period to produce a usable image on the receiver

B. PMT (photo-mechanical transfer) — Trade name of diffusion transfer material marketed by the Eastman Kodak Company

C. Diffusion transfer negative paper — A light-sensitive camera speed paper designed for use in a process camera

D. Diffusion transfer receiver paper — A non-light-sensitive, but chemically sensitive paper that accepts the transferred image as a positive print

E. Diffusion transfer transparent receiver sheet — A non-light-sensitive, but chemically sensitive material with a transparent base

F. Activator — A one-step, ready-to-use processing chemical used in a diffusion transfer processor

G. Copy dot — Making a line negative of a screened halftone illustration

H. Posterizing — The practice of compressing a full range of tones in a picture into a few flat tones

I. Duplicating film — A contact speed, thin base film used to make duplicates of an original negative or positive

J. Contact film — A contact speed, thin base film used to make a film positive from a film negative

(NOTE: Contact film may also be used to make a negative from a film positive.)

K. Spread — A contact process by which normal line images are made fatter without altering their shape or location; made from film negatives

L. Choke — A contact process by which normal line images are made thinner without altering their shape or position; made from film positives

M. Combination print — A halftone combined with reverse lettering

N. Two-tone posterization — A line shot of a photograph which reduces the many tones found in the photo to a simple black and white illustration

INFORMATION SHEET

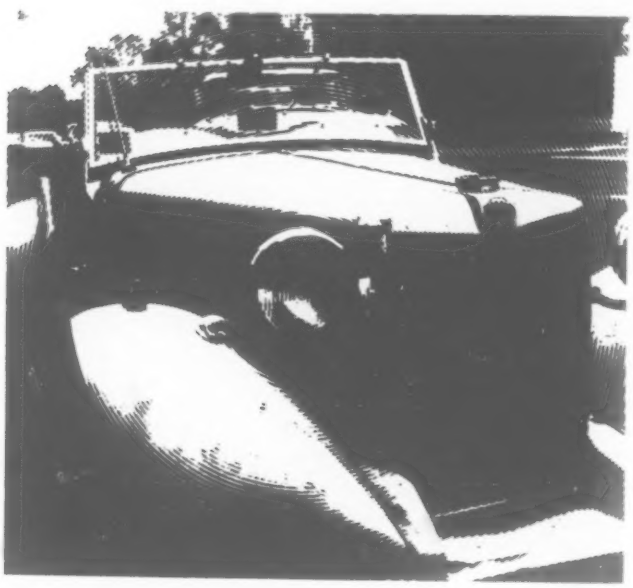
O. Three-tone posterization — Essentially the same as a two-tone posterization but a second exposure is added using a screen tint which creates a third tonal value in the middletone area

P. Three-color posterization — Three separate exposures reproduce three different areas of a photograph; using film, one negative is exposed for a solid step 2 on the gray scale, another negative is exposed for a solid 4 and the third negative is exposed for a solid 6 on the gray scale

Q. Color key proofing material — Clear sheeting with a colored light-sensitive coating; exposed to negatives to generate a colored proof of the image on the negative

R. Special effects screen — A screen used in the photographic process to generate different patterns or textures within the photo reproduction; used to lend eye appeal to an illustration and lend a greater degree of creativity to the reproduction process

(NOTE: In the following example, a concentric circle screen tint was used for a three-tone posterization to draw the eye to an accentuated area.)



Courtesy ByChrome Company

INFORMATION SHEET

(NOTE: In the following example, a subtle grainy-textured effect is achieved in a three-tone posterization by use of a fine mezzo 25% screen tint.)

Courtesy ByChrome Company

II. **Care of a diffusion transfer processor**

A. Clean the processor daily.

B. Drain activator into the storage container.

C. Remove and wash the tray with warm water.

D. Clean the processor rollers.

E. Dry and reassemble the processor.

III. **Materials and equipment necessary to make a diffusion transfer print**

A. Diffusion transfer negative paper

B. Diffusion transfer receiver paper .

C. Activator

D. Camera

E. Processor

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #1--DETERMINE BASIC EXPOSURE AND MAKE A DIFFUSION TRANSFER LINE PRINT

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Camera and diffusion transfer processor set up correctly	_____
• Diffusion transfer negative properly exposed and processed	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Process camera
2. Diffusion transfer processor
3. Diffusion transfer activator
4. Diffusion transfer negative paper
5. Diffusion transfer receiver paper
6. Stouffer 12 step reflection gray scale
7. Sample copies of phototype, typewriter copy, and line illustrations

B. Procedure

1. Set up the camera.

   (NOTE: See Job Sheet #1, Unit II.)

2. Set up the diffusion transfer processor.

   (NOTE: Refer to instruction manual.)

3. Fasten small strips of the sample line copies on a cardboard.
4. Place copyboard in the horizontal position and raise the glass cover.
5. Place the sample copies on the center of the copyboard.
6. Place the 12-step reflection gray scale next to the copy on the copyboard and close the copyboard.

JOB SHEET #1

7. Return copyboard to vertical position.

8. Set the *f*/stop.

   (NOTE: Check with instructor if necessary.)

9. Set the camera controls on 100% (same size) reproduction.

10. Set the camera timer to make a 10 second exposure.

11. Place a sheet of diffusion transfer negative paper on the center of the vacuum back with emulsion side up.

    (NOTE: Always handle the negative by the edges.)

12. Turn on the vacuum and close the vacuum back.

13. Make an exposure by starting the timer.

14. Turn the vacuum off and remove the exposed negative.

15. Position the exposed diffusion transfer negative paper with its emulsion side up in contact with the coated side of the diffusion transfer receiver sheet.

    (NOTE: The dark side of the diffusion transfer negative is the emulsion side. The coated side of the receiver sheet has no visible marks or printing.)

16. Align the negative and receiver combination on the feed tray of the diffusion transfer processor.

    (NOTE: Follow processor manufacturer's recommendation on proper method of feeding the paper.)

17. Feed negative and paper into the processor.

    (NOTE: Make sure the negative paper goes under the separator fin and receiver sheet over the fin. When they exit, hold them in contact for 30 to 60 seconds. This operation must be done under red safelight.)

18. Peel the negative paper away from the receiver paper and discard the negative.

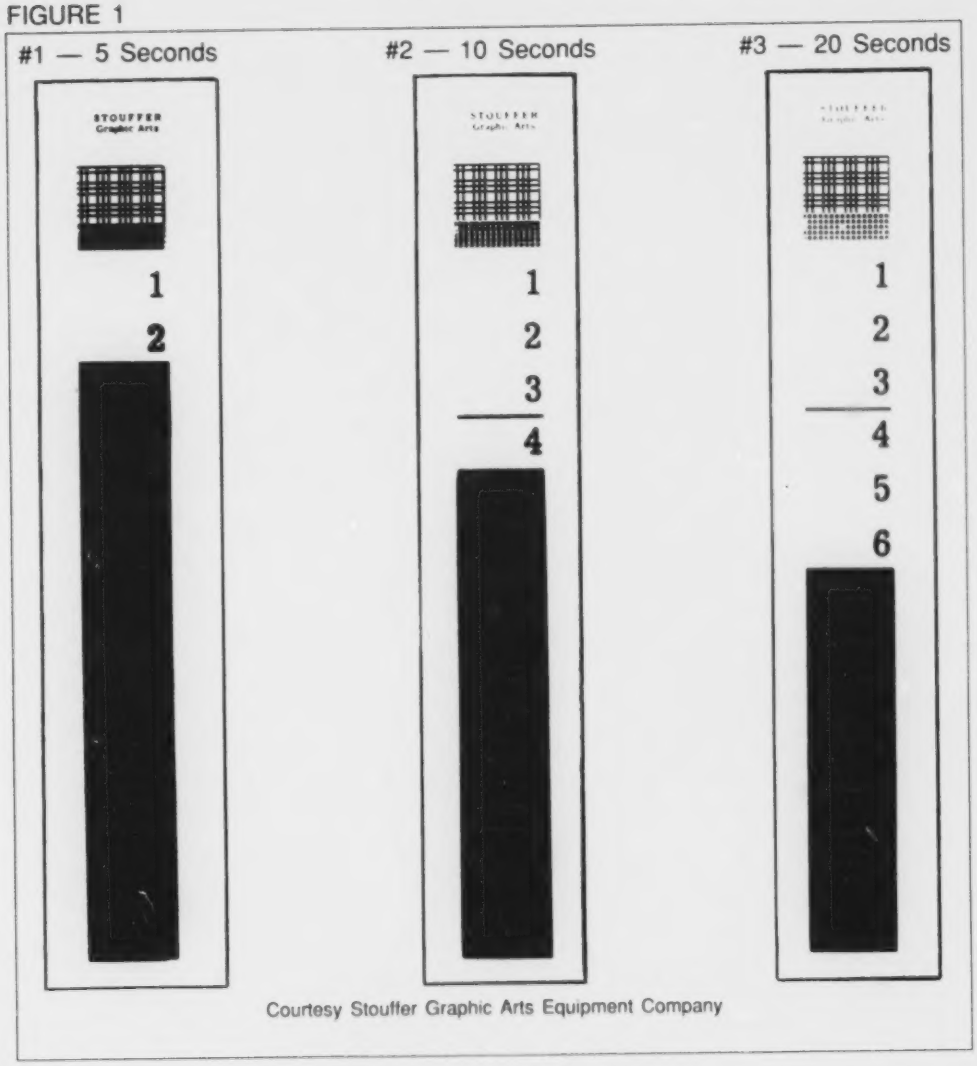
    (NOTE: The remaining steps should be done in normal room light.)

19. Examine the gray scale on the receiver paper. Remember, the gray scale step 4 is only a guide. The most accurate copy reproduction occurs when the camera operator compares the original copy with the reproduction.

    (NOTE: If the exposure used did not yield a solid step 4 on the gray scale, apply the following concept to make an exposure adjustment to get the desired results: Every 2 steps on the gray scale is either 2X or ½ the basic exposure time. Note that gray scale #2 received ½ the exposure as gray scale #1. Also note that gray scale #3 received twice the amount of exposure as gray scale #1.)

JOB SHEET #1

FIGURE 1



Courtesy Stouffer Graphic Arts Equipment Company

20. Adjust exposure if necessary.

21. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #2--PROGRAM A Q15 EXPOSURE COMPUTER AND MAKE A DIFFUSION TRANSFER HALFTONE PRINT

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Equipment properly set up	_____
• Series of exposures correctly made and processed	_____
• Print examined and computer properly programmed	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Kodak Q15 Exposure Computer
2. Kodak 24 Step Reflection Density Guide Q16
3. Reflection densitometer (optional)
4. Magnifier (10X)
5. Diffusion transfer gray contact screen
6. Diffusion transfer negative paper
7. Diffusion transfer receiver paper
8. Diffusion transfer activator
9. Diffusion transfer processor
10. Process camera
11. Black-and-white photograph
12. Masking tape

JOB SHEET #2

B. Procedure

1. Set up the diffusion transfer processor.
2. Set up the camera for 1:1 (100%) reproduction.
   a. Set *f*/stop on *f*/22.
   b. Set timer.

   (NOTE: Use an exposure of approximately six to eight times the normal line exposure. In this example a 30 second exposure is used.)
3. Place a Kodak Reflection Density Guide (24 step) on the copyboard.
4. Place a sheet of 8 × 10 or 10 × 12 inch diffusion transfer negative material on the vacuum back with the emulsion side up.
5. Cover up approximately one inch of the edge of the diffusion transfer negative material and screen widthwise with a piece of cardboard and tape it down.
6. Place the diffusion transfer gray contact screen, emulsion side down, over negative material.

   (NOTE: To ensure a good contact, the screen should be at least 1 inch larger on all four sides than the diffusion transfer negative.)
7. Wipe the contact screen lightly with a photo chamois or rubber roller to work air bubbles out.
8. Make an exposure and open the camera back.

   (NOTE: Do not turn the vacuum off.)
9. Uncover the covered area and cover the exposed area of the diffusion transfer negative material with contact screen in place.
10. Make a series of flash exposures.

    (NOTE: Use a piece of cardboard to step off a series of at least five 5-second exposures by moving the cardboard ½ inch each time.)
11. Remove the contact screen and place it in its original container.
12. Place the negative on a sheet of receiver paper and process.

JOB SHEET #2

13. Examine the dot structure of the print with a magnifier; identify appropriate size of highlight and shadow dots.

    (NOTE: The normal highlight dots should fall on step .00 or higher density of the gray scale. If they do not, another exposure must be made by increasing the exposure. Ask the instructor what the normal highlight dots should be. There will be no dots in the area of the print that represents the darkest steps of the gray scale, but dots do appear in lower density steps (shadow dots). Select the normal highlight and shadow dot, and note the density of the corresponding steps. In this example we will use hypothetical numbers of .30 for highlight and 1.20 for shadow. Student should use the actual steps that produced the normal highlight and shadow dots. Subtracting highlight density (.30) from shadow density (1.20), we arrive at a Basic Density Range (BDR) of .90. If the original copy has a BDR of .90, a single exposure (main) will reproduce a good halftone print. The BDR will remain the same in any darkroom as long as the same equipment, materials, and techniques are used.)

14. Program the computer to determine main and flash exposures.

    (NOTE: Refer to Job Sheet #1 in Unit III. Reviewing the outlined procedure will help you set up the Q-15 halftone computer. Depending upon your understanding of the halftone reproduction process you may want to review all of Job Sheet #1.)

15. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #3--MAKE A TWO-TONE POSTERIZATION USING DIFFUSION TRANSFER MATERIAL

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Diffusion transfer processor, camera, and copyboard correctly set up	_____
• Two-tone posterization correctly exposed and processed	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Diffusion transfer processor
2. Process camera
3. Activator
4. Diffusion transfer negative material
5. Diffusion transfer receiver material
6. Continuous tone photograph

B. Procedure

1. Set up diffusion transfer processor.
2. Set up camera for diffusion transfer line copy.
3. Place continuous tone copy on copyboard.

   (NOTE: Photos that work best for the posterization process typically are fairly high contrast and show the main subject close up to show as much detail as possible. Detail with vertical and horizontal patterns works extremely well.)

4. Place diffusion transfer negative material on the vacuum back with the emulsion side up.
5. Turn on the vacuum and make a normal line exposure.

JOB SHEET #3

6. Place diffusion transfer negative on a sheet of receiver paper and process.

   (NOTE: The resulting print with burned out highlights and solid black shadows is called a two-tone posterization. Posterizing techniques are subjective and can be varied to produce diverse effects.)

7. Clean work area and return equipment and supplies to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #4--MAKE A THREE-TONE POSTERIZATION USING SPECIAL EFFECTS SCREEN AND DIFFUSION TRANSFER MATERIAL

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Diffusion transfer processor, camera, and copyboard correctly set up	_____
• Three-tone posterization using special effects screen correctly exposed and processed	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Diffusion transfer processor
2. Process camera
3. Activator
4. Diffusion transfer negative material
5. 30% or 40% screen tint
6. Diffusion transfer receiver material
7. Continuous tone photograph

B. Procedure

1. Set up diffusion transfer processor.
2. Set up camera for diffusion transfer line copy.
3. Place continuous tone copy on copyboard.
4. Place a sheet of diffusion transfer negative paper on vacuum back with emulsion side up.
5. Turn on vacuum and make a line exposure equal to two-thirds the normal exposure.

   (NOTE: If, for example, 9 seconds is considered a normal exposure, 6 seconds would be used as the line exposure in this case.)

JOB SHEET #4

6. Open the vacuum back.

   (NOTE: Do not turn the vacuum off.)

7. Place a 30% or 40% screen tint emulsion side down over the exposed diffusion transfer negative material.

8. Reset the camera timer for approximately 4 times the length of exposure time being used.

9. Close vacuum back and make the exposure.

10. Place the diffusion transfer negative on a sheet of receiver paper and process.

    (NOTE: This print, in addition to having burned out highlights and a solid shadow, also has a light tint in the middletone area which considerably enhances the detail. Posterization techniques are subjective and may be varied to produce diverse effects. Ask the instructor for other screen patterns to experiment with. Special effects screens that work well with this process include mezzotint, straight line, wavy line, concentric circle and steel etch.)

11. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #5--MAKE A THREE-COLOR POSTERIZATION USING GRAPHIC ARTS FILM

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom, camera, and copyboard correctly set up	_____
• Films properly exposed and processed	_____
• Three-color posterization made and correctly mounted in register on card stock	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Process camera
2. Necessary items for tray processing graphic arts film
3. Necessary chemicals for processing film
4. Cameraman's sensitivity guide (gray scale)
5. High contrast graphic arts film
6. Continuous tone photograph
7. White card stock
8. Color key proofing material

B. Procedure

1. Set up darkroom.
2. Set up camera for making a line exposure.
3. Place continuous tone copy with gray scale on the copy board.
4. Place a piece of graphic arts film emulsion up on vacuum back and turn on vacuum.

JOB SHEET #5

5. Make a line exposure that will yield approximately a solid 4 on the gray scale.

6. Process film.

7. Expose another piece of film to yield a solid 6 on the gray scale and process film.

8. Expose another piece of film to yield a solid 8 on the gray scale and process film.

   (NOTE: Films may be exposed and processed as indicated or they may be exposed, then boxed back up and all may be processed at the end of the exposing cycle.)

9. Make color key proof of three negatives.

   (NOTE: The lightest color proof should be used for the negative exposed to a step 4, for example, if these colors are available, yellow would be good to use for the step 4 negative, magenta would be good for the step 6 negative and cyan would be good for the step 8 negative.)

10. Mount color proof in register on white card stock.

    (NOTE: Mount colors on white card stock with the lightest color first. Use masking tape to tape color proof to the card stock.)

11. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #6--MAKE A DUPLICATE NEGATIVE AND A FILM POSITIVE USING GRAPHIC ARTS FILM

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom and vacuum printer properly prepared	____
• Negative and positive correctly exposed and processed	____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Contact frame/vacuum printer
2. Basic darkroom equipment and chemicals
3. Duplicating film (May be either roomlight or darkroom type. Check with your instructor.)
4. Negative

B. Procedure

1. Set up darkroom.
2. Clean the glass of the vacuum printer.
3. Place a masking sheet on the rubber matt of the vacuum printer.
4. Cut a sheet of duplicating film into desired size.

   (NOTE: The film should be the same size or larger than the negative.)
5. Place the duplicating film on the masking sheet with the emulsion side up.
6. Place the negative on top of the duplicating film with emulsion side up.

   (NOTE: For faithful reproduction of an original, contacting should be done emulsion to emulsion. In this case the loss of extremely fine details will not be noticeable because of the thin film base. However, for uniformity of the finished product, the original should not be used with the duplicate. It is recommended that more duplicates be made.)

JOB SHEET #6

7. Turn on the vacuum.

   (NOTE: Pull as high a vacuum as possible, preferable in the range of 25 to 27 inches of mercury on the vacuum indicator.)

8. Make an exposure.

   (NOTE: If the platemaker is a flip top, it must be flipped before exposing. If it is not, or if using a contact frame with point-source light, it is ready to be exposed. If the exposure time has not been determined prior to this job sheet, it should be done at his time. To determine the exposure time, step off a series of five second exposures. Process and dry the negative. Examine the negative and select the step that is the same as the original. The exposure time that was used for this step will be the exposure time for this film.)

9. Process the film.

   (NOTE: Process this film following the same procedures used for line or halftone films. Always follow manufacturer's recommendations for the product you are using. CHECK WITH YOUR INSTRUCTOR.)

10. Make a film positive.

    (NOTE: There are several methods of making film positives. One method is using a diffusion transfer transparent sheet. Another method is using line film and the contact printer or bright light duplicating film negative and the platemaker or contact printer. The procedure is the same as when making a duplicate negative. Ask the instructor which film and method should be used, remembering that the line film must be used in the darkroom under red safelight.)

11. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #7--MAKE A SPREAD AND CHOKE USING GRAPHIC ARTS FILM

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Darkroom properly set up and components placed on vacuum printer in register and in correct order	_____
• Films correctly exposed and processed to produce a spread and choke	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Vacuum printer
2. Resister punch and pins
3. Duplicating film (may be either roomlight or darkroom type depending upon your shop conditions)
4. Line negative
5. Basic darkroom equipment
6. Chemicals (developer, stop bath, fixer)
7. Diffusion sheet

B. Procedure

1. Set up the darkroom.
2. Place a masking sheet on the rubber matt of the vacuum printer.
3. Punch a sheet of duplicating film with register punch.
4. Punch a sheet of clear plastic with a thickness of approximately .004".

   (NOTE: A fixed, washed, and dried sheet of unexposed film may be used.)
5. Punch the line negative.

JOB SHEET #7

6. Place the sheet of punched duplicating film on the vacuum printer with the emulsion side up.

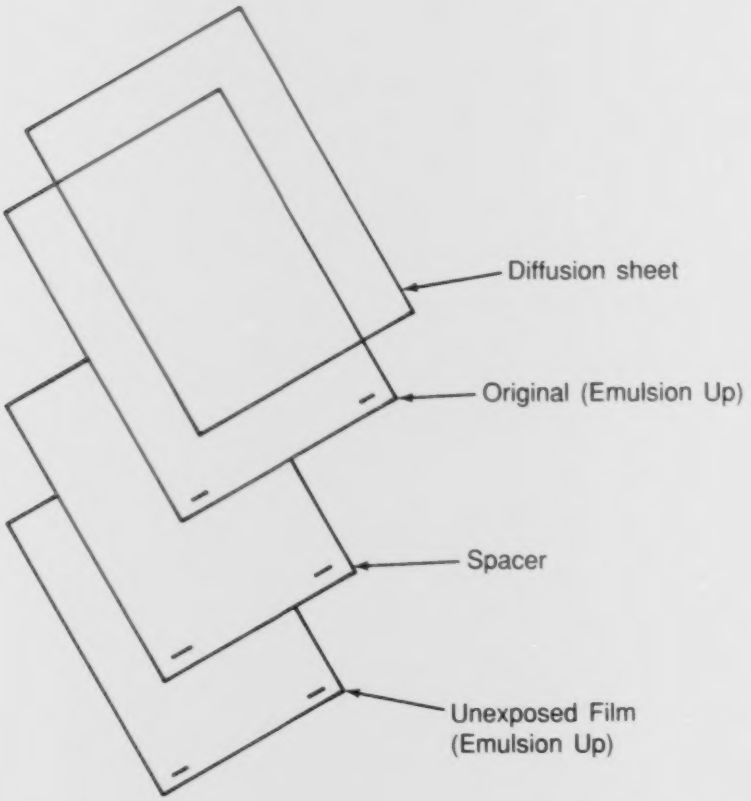
   (NOTE: Use register pins.)

7. Register the spacer sheet on top of the film.

   (NOTE: The spacer sheet is the sheet of plastic or film base that was punched earlier. Different thicknesses of the spacer sheet will produce different results.)

8. Register the line negative on top of the spacer sheet with the emulsion side up. (Figure 1).

FIGURE 1



JOB SHEET #7

9. Place a diffusion sheet on top of the line negative.

10. Turn the vacuum on.

11. Expose and process the film.

    (NOTE: Refer to Job Sheet #6 for exposure time.)

12. Process, wash, and dry the negative.

    (NOTE: The result is a negative that is somewhat larger, the lines heavier. This is a spread negative. If a positive spread is required, use the same procedures outlined except use negative duplicating film in place of positive duplicating film.)

13. Produce a choke.

    (NOTE: Procedures for producing a choke are identical to producing a spread, except a film positive is used in place of a line negative. Refer to Job Sheet #6 for making a film positive.)

14. Clean work area and return equipment and materials to proper storage.

OTHER DARKROOM TECHNIQUES
UNIT IV

JOB SHEET #8--MAKE A COMBINATION PRINT WITH REVERSED TYPE OVERPRINTED IN A SECOND COLOR

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Halftone and line negatives correctly made	_____
• Film positive and spread negative correctly made	_____
• Films assembled in register and color key proof correctly made for a combination print with type overprinted	_____

Introduction: This exercise will give the student experience in traditional darkroom techniques.

A. Equipment and materials

1. Process camera
2. Contact frame/vacuum printer
3. Darkroom equipment and processing chemicals
4. Density guide or densitometer
5. Contact screen for halftone negatives
6. Graphic arts film for making line and halftone negatives
7. Contact film (roomlight or darkroom type depending upon shop conditions)
8. Duplicating film (roomlight or darkroom type depending upon shop conditions)
9. Spacer material (clear polyester or unexposed film, fixed and washed)
10. Graphic arts magnifier
11. Color key
12. Processing chemicals

JOB SHEET #8

13. Suitable combination copy

    (NOTE: Instructor will provide suitable copy for this activity. Copy should consist of a continuous tone photograph mounted on a base sheet. Registered to the base sheet should be one overlay flap with typographical material: one or two words in 24 to 36 point type is suitable. Registered to the base sheet should be another overlay flap using amber or ruby peel coat. To complete this overlay the peel coat material should be trimmed inside the edge of the photo, the surrounding material should be peeled away, leaving peel coat material showing over the photo image area. Traditional register marks or a punch register system may be used to register the two overlays to the base art.)

B. Procedure

1. Use instructor-provided copy to make a halftone negative.

   (NOTE: Student may want to review Unit III on halftone negative procedures.)

2. Register overlay of type to base art and make a line negative; referred to as *line negative #1.*
3. Register the other overlay to base art and make line negative of amber or ruby peel coat window; referred to as *line negative #2.*
4. Use line negative #1 in vacuum printer with contact film to make a *film positive #1a.*

   (NOTE: Use emulsion up orientation for film contacting procedures.)

5. Again, use line negative #1 in vacuum frame with appropriate spacer material and duplicating film to make a *spread negative #1b.*
6. With the aid of the instructor, strip film positive #1a to the halftone negative, both film emulsions down; use register marks or punch register to align films.

   (NOTE: Film positive should be on top of halftone negative when the two negatives are viewed right reading. Film positive may be taped to halftone to maintain register position.)

7. Register combined assembly of halftone negative and film positive to the window negative identified as line negative #2; once again taping of films is appropriate to maintain register.
8. Expose and process black color key using film assembly identified in Step 7.
9. Expose and process red or blue color key proof using spread negative #1b.
10. Using white card stock, register and tape in position the two previously generated pieces of color key material.

    (NOTE: If the instructor has not already explained, ask why it is necessary to spread an image that overprints an area that has been reversed out.)

11. Clean work area and return equipment and materials to proper storage.

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to make a set of uncorrected direct screen four-color separation negatives and use acetate overlay proofing material to make a full color proof. Competencies will be demonstrated by completing the job sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to process color photography with their correct definitions.
2. Distinguish between additive and subtractive primary colors.
3. Select true statements concerning the functions of printing inks.
4. Select true statements concerning color separation.
5. Name methods for making color corrections.
6. Make a set of unmasked direct screen four-color separation negatives. (Job Sheet #1)
7. Make an acetate overlay proof. (Job Sheet #2)

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

INFORMATION SHEET

I. Terms and definitions

A. Color separation — A process of separating the color original into three black-and-white negatives

B. Color correction — The process of compensating for ink deficiencies in making separation negatives

C. Code notch — One or more notches on one corner of a sheet of film used to identify the emulsion and emulsion side of the film

(NOTE: Notches are primarily used on panchromatic film and transparent materials.)

D. Complementary color — The color that is opposite another color on a color wheel

E. Cyan — A blue-green color that is used in color separation and color printing

F. Magenta — A dark pink color that is used in color separation and color printing

G. Mask — A black-and-white photographic image of a color original used for color correction

H. Moire — An undesirable pattern on a halftone negative created by the improper angling of the contact screen

I. Neutral density filter (ND) — A gray-colored filter used to add density with no change in color

J. Panchromatic film — Film that is sensitive to all colors of light

K. Primary colors — Colors which cannot be produced by mixing other colors

L. Separation negative — The negative that represents one of the primary colors from a color original

M. Scanner — A color separation device that electronically processes images through circuits that correct color and enhance detail

N. Acetate proofing system — A system used to proof separation negatives

(NOTE: The colorant used on the acetate overlay sheet is selected so that when the four process colors are mounted in register, the proof will produce a close visual simulation of the printed job.)

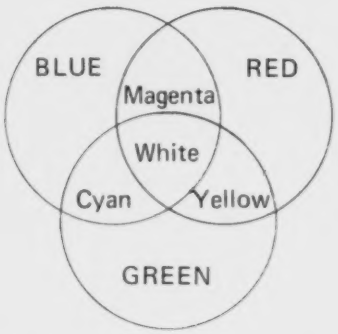
INFORMATION SHEET

II. Primary colors

A. Additive primary colors

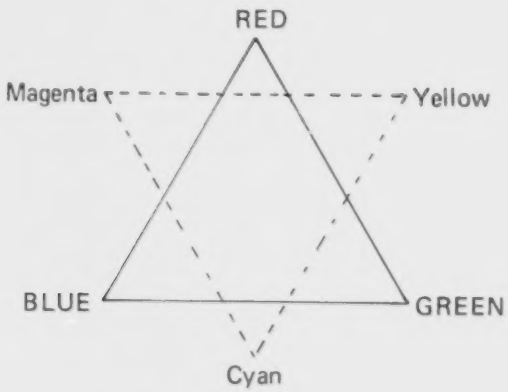
1. The additive primary colors are blue, green and red.

2. When the three additive primary colors are added together, they will form white light.



3. When one color is subtracted, the remaining two will form another color which is complementary to the subtracted color.

(NOTE: If the blue light is subtracted, the red and green will form yellow, which is complementary to blue.



INFORMATION SHEET

B. Subtractive primary colors

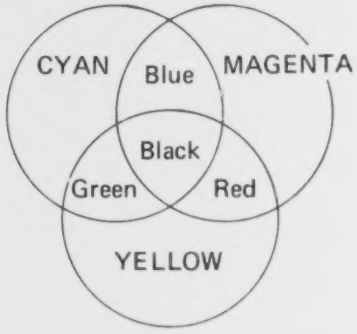
1. The subtractive primary colors are cyan, magenta, and yellow.

2. Cyan, magenta and yellow are the complementary colors of additive primary colors.

3. When the cyan, magenta, and yellow inks are mixed together in various proportions, they produce a full range of colors.

4. Cyan, magenta, and yellow are also called process colors.

5. When solid layers of the process colors are printed on a white sheet, they produce black.



III. Functions of printing inks

A. Inks absorb light.

B. Inks are used to control the light that is permitted to strike the paper and to be reflected from it.

C. Each of the three primary colored printing inks absorbs one of the three component colors of white light and leaves the other two components to be reflected.

1. Cyan ink absorbs the red part of white light.

(NOTE: Where cyan ink is printed, only green and blue light can be reflected from it. This combination of green and blue light appears cyan in color.)

2. Magenta ink absorbs the green part of white light.

   (NOTE: Where magenta ink is printed, only red and blue light can be reflected from it. This combination of red and blue light appears magenta in color.)

3. Yellow ink absorbs the blue part of white light.

   (NOTE: Where yellow ink is printed, only red and green light can be reflected from it. This combination of red and green light appears yellow in color.)

4. Black ink absorbs all components of white light.

   (NOTE: Its only function in four-color printing is to increase the contrast of the reproduction.)

IV. Color separation

A. Three plates are used for printing the three colored inks.

   (NOTE: Four plates will be necessary if a black printer is also used.)

B. Each plate records either the cyan, magenta, or yellow ink.

C. Three separate negatives are needed, each one representing one of the primary colors.

   (NOTE: To avoid moire, each separation negative is made at a different screen angle, i.e., cyan printer at 105°, yellow printer at 90°, magenta printer at 75°, and black at 45°.)

D. Negatives are made by photographing the color original three times through three different filters on black-and-white panchromatic film.

E. The cyan printer separation negative is made by exposing through a red filter.

F. The magenta printer separation negative is made by exposing through a green filter.

G. The yellow printer separation negative is made by exposing through a blue filter.

INFORMATION SHEET

V. Methods for making color corrections

(NOTE: Printing three color images (cyan, magenta, and yellow) with one on top of the other in perfect register will not reproduce a faithful image of the original. The problem is not in faulty craftsmanship, filters, or the process, but rather in the inks. Process inks are not pure absorbers. Each of the inks absorbs some of the other two colors in addition to its complementary color. The result is a low contrast and muddy reproduction. The correction is achieved by printing less of the inks of certain colors in specific areas. There are three popular methods of color correcting which are described below.)

A. Photographic masking

1. Photographic mask—A weak image of the color original on photographic film.

2. Mask—Used with either the color copy or the negative when making separation negatives.

(NOTE: Photographic masking is the most popular method of color correcting. There are several methods of masking: positive masking, negative masking, camera back masking, using an enlarger, using a contact frame, single stage masking, two stage masking, etc. Although a very important part of the process photography, masking procedures will not be discussed in this unit due to the time-consuming nature of the process in a typical school shop. However, a job sheet on unmasked direct screen color separation is included. Unmasked separations are extensively used in newspaper reproduction. Masking is strongly recommended if time permits.)

B. Electronic scanning

(NOTE: Electronic scanning is becoming very commonplace in magazine and trade journal publication – a direct result of computer-to-plate technology. Even in production departments using color separations, computer scanning is an important quality control tool.)

C. Localized dot etching

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

STUDENT SUPPLEMENT #1 – DIRECT SCREEN SEPARATION RECORD

Subject Matter _____ Date _____

Contact Screen: Type _____

Ruling _____

Printer	Filter	Main Exposure	Flash Exposure
Cyan	PM23A/25		
Magenta	PM58		
Yellow	PM47B/47		
Black	PMK2		

Suggested AIM points for negative dot percentages on halftone separation negatives

	A (Highlight)	M (Middletone)	B (Shadow)
Cyan	95 ± 2%	50 ± 3%	10 ± 4%
Magenta	97 ± 2%	63 ± 3%	20 ± 4%
Yellow	97 ± 2%	63 ± 3%	20 ± 4%
Black	Solid	Solid	55% ± 5%

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

JOB SHEET #1--MAKE A SET OF UNMASKED DIRECT SCREEN FOUR-COLOR SEPARATION NEGATIVES

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Appropriate filter and screen angle used with each negative	_____
• Separation negatives made with correct dot percentages in A, M, and B patches as specified	_____

Introduction: This exercise is representative of four-color process photography work found in day-to-day newspaper operation. Although higher quality printing jobs require color correction in some form, masking being the most popular, this exercise covers only the basic procedures of producing four-color negatives.

A. Equipment and materials

1. Process camera
2. Standard darkroom equipment

   (NOTE: See unit on halftone photography for the list of equipment.)
3. Flash lamp with 7 1/2 watt frosted bulb and ND No. 96 (1.30 density) filter
4. Preangled chipboard

   (NOTE: This chipboard was made in the unit entitled "Halftone Photography.")
5. Kodak Color Separation Guide with A, M, B Patch, Q13
6. Color illustration (photograph)

   (NOTE: Instant color prints are not suitable for this process.)
7. Filter holder
8. Filters (PM23A, PM58, PM47B, K2)

   (NOTE: These filters may be substituted with the following: No. 25 for PM23A, and PM47 for PM47B.)
9. Black masking tape
10. Transparent tape

JOB SHEET #1

11. Gray contact screen

12. Panchromatic film

13. Magnifying glass

14. Kodak Direct Screen Calculator Q-10B

B. Procedure

1. Set up the process camera.

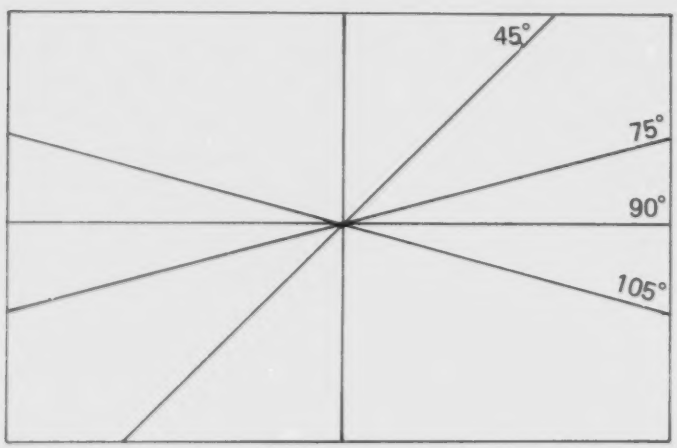
2. Set up the darkroom and stabilize the temperature.

3. Set up flash lamp for making flash exposure.

   (NOTE: A conventional flash lamp filter is not suitable for the separation process. A neutral density filter No. 96 [1.30 density] over a 7 1/2 watt frosted tungsten bulb 7 feet from the camera back is recommended.)

4. Place the preangled chipboard on the copyboard and fasten it down (Figure 1).

   FIGURE 1

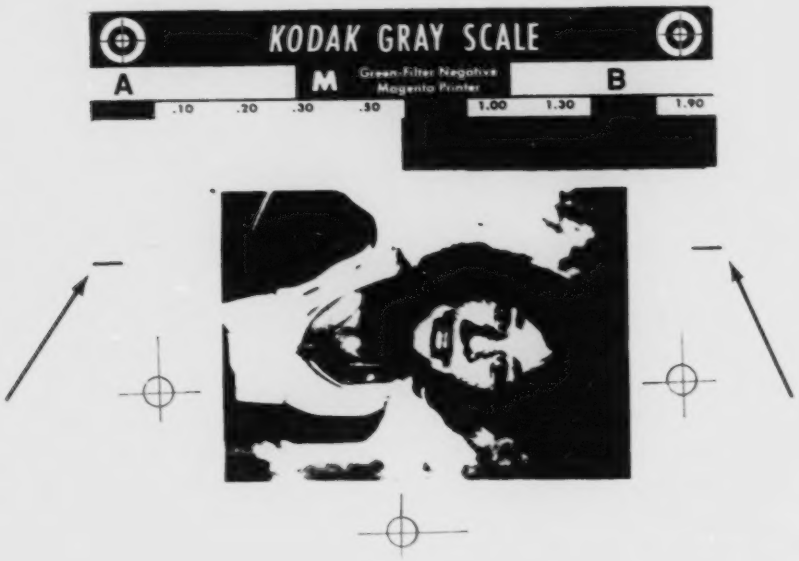


5. Place a Kodak Color Separation Guide (A, M, B Patch) next to the original color illustration. Add registration marks as indicated.

JOB SHEET #1

6. Fasten these two pieces on a mounting board that is approximately the same size as the two pieces (Figure 2).

FIGURE 2



7. Draw two short lines on the center of the mounting board, one on the top and one on the bottom. (See Figure 2.)

8. Place the copy on the center of the preangled chipboard and line up the short lines of the copy with the 105° line.

9. Set up the camera for the first trial exposure by placing a PM 23A or a number 25 (red) filter in the filter holder of the camera.

10. Set the lens at *f* /16 and timer at 25 seconds.

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JOB SHEET #1

11. Set the flash exposure at 20 seconds.

    (NOTE: Due to extreme differences in cameras, lighting systems and films, the main and flash exposures are listed as trial exposures. The actual determination of the acceptability of a particular separation negative must be evaluated by checking the A, M, and B patch dot size. The A patch dot may be adjusted for proper size by using the trial exposure in conjunction with the Q-10B exposure calculator. The shadow dot (B patch) may be adjusted in dot size by using the traditional flash step-off test to determine a basic flash and adjusting the flash exposure to correspond for the density of step B. In some instances it is not unusual for the M patch dot size to fall outside recommended tolerance when using the main/flash exposure system. Once the correct main/flash exposures have been determined, they may be recorded on Student Supplement #1. A permanent record of this information will be helpful if subsequent separations are to be made.)

12. Set the darkroom timer to 2 minutes and 45 seconds (2:45).

    (NOTE: A timer with a buzzer is recommended to signal the end of the developing time.)

13. Place reference marks on the camera back.

    (NOTE: Place two pieces of black masking tape at right angles to each other on the camera back to aid in the positioning of the film in total darkness. Since the copy is angled on the copyboard, a much larger sheet of film must be used to cover the entire copy. A 10" x 12" sheet of film is recommended for a 4" x 5" copy.)

14. Turn all lights off.

    (NOTE: Before doing so, remember where everything is [for example, the film, screen, developer, and fixer].)

15. Place a sheet of panchromatic film on the camera back with the emulsion side up.

    (NOTE: The emulsion side is up when the code notice is in the top right hand corner of the film.)

16. Place the contact screen on the top of the film with the emulsion side down.

    (NOTE: Make sure the screen is parallel with the camera back and is placed at the same position for all four separation negatives. To ensure this, the contact screen may be fastened to the camera back with black masking tape.)

17. Rub the screen with the back of your hand or a rubber roller to ensure a good contact.

18. Expose for main and flash.

JOB SHEET #1

19. Develop, fix, and wash the film.

    (NOTE: Refer to the unit on halftone photography for the proper methods of film processing.)

20. Examine the negative on a light table with a magnifying glass.

    (NOTE: Check the dot sizes in A, M, and B Patch. The aim points for this negative [cyan printer] are: A-step—95% ± 2%, M-step—50% ± 3%, and B-step—10% ± 4%. If these percentages are not present, remake the negative. Use a Q-10B Exposure Computer and alter the exposure until the desired dot structure is achieved. Keep a record of the exposures of all four separation negatives; it will help reduce the remaking of future separation negatives.)

21. Turn the copy on the copyboard and line up the short lines of the copy with the 75° line.

22. Place a PM58 (green) filter in the filter holder of the camera.

23. Set the lens at *f* /16 and timer at 70 seconds.

24. Set the flash exposure at 20 seconds.

25. Repeat procedure steps 12 through 20.

    (NOTE: The aim points for this negative [magenta printer] are: A-step—97% ± 2%, M-step—63% ± 3%, and B-step—20% ± 4%. Remake if necessary.)

26. Turn the copy on the copyboard and line up the short lines of the copy with the 90° line.

27. Place a PM47B (blue) filter in the filter holder of the camera.

28. Set the lens at *f* /11 and timer at 130 seconds.

29. Set the flash exposure at 20 seconds.

30. Repeat procedure steps 12 through 20.

    (NOTE: The aim points for this negative [yellow printer] are the same as magenta printer: A-step—97% ± 2%, M-step—63% ± 3%, and B-step—20% ± 4%. Remake if necessary.)

31. Turn the copy on the copyboard and line up the short lines of the copy with the 45° line.

32. Place a K2 filter (yellow) in the filter holder of the camera.

33. Set the lens at *f* /16 and timer at 20 seconds.

JOB SHEET #1

34. Repeat procedure steps 12 through 20.

    (NOTE: DO NOT FLASH THIS NEGATIVE. The aim points for this negative [black printer] are: A-step—no dots, M-step—no dots, and B-step—55% ± 5%. Remake if necessary.)

35. Clean work area and return equipment and materials to proper storage.

OVERVIEW OF PROCESS COLOR PHOTOGRAPHY
UNIT V

JOB SHEET #2--MAKE AN ACETATE OVERLAY PROOF

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Proofing material properly exposed and developed	_____
• Overlay proof mounted in register and in proper sequence on white cover stock	_____

Introduction: Acetate overlay proofs are useful to approximate the final appearance of a four-color printing job. This exercise gives the student experience in producing this valuable tool.

A. Equipment and materials

1. Vacuum printer/platemaker
2. Table or sink for processing acetate sheets
3. Transparent gray scale (used for correct exposure determination)
4. Acetate overlay proofing material (3-M Color-Key or comparable product)
5. Required processing solution
6. Newsprint or other absorbent paper
7. Squeegee
8. Cotton pads
9. Transparent tape
10. White cover stock for mounting acetate proof

B. Procedure

1. Set up vacuum printer to make test exposure.
2. Make step-off exposure using transparent gray scale.

   (NOTE: Check with instructor for exposure times and procedure to be used for step-off test.)

JOB SHEET #2

3. Process test exposure material according to manufacturer's recommendation.
4. Evaluate test results and determine exposure to be used.
5. Proof all four separation negatives on their respective color proofing materials.
6. Mount yellow proof on white cover stock with transparent tape.
7. Place the magenta printer on top of the yellow; with the aid of the magnifying glass and register marks on the two proofs, bring the two images into register.
8. Tape the magenta printer along the top edge.
9. Register the cyan printer with the other two and tape it down on the top edge.
10. Register the black printer with the previous three and tape down along the top edge.
11. Turn in the registered proof and separation negatives to the instructor.
12. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to strip negatives using a variety of flat systems commonly used in the graphic arts industry. Competencies will be demonstrated by completing the job sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

1. Match terms related to stripping procedures with their correct definitions.
2. Match stripping tools and materials with their proper uses.
3. Identify the parts on a layout of a typical flat.
4. Select true statements concerning the emulsion side and the base side of a negative.
5. Select true statements concerning the methods of combining line and halftone work.
6. Name types of combination printing.
7. Identify stripping register marks and pins.
8. Lay out and strip an unruled flat. (Job Sheet #1)
9. Strip a ruled flat. (Job Sheet #2)
10. Strip for step-and-repeat. (Job Sheet #3)
11. Combine line and halftone work. (Job Sheet #4)
12. Strip for combination print. (Job Sheet #5)
13. Strip complementary flats for multi-color printing. (Job Sheet #6)
14. Lay out signature flats for multi-page or book printing. (Job Sheet #7)
15. Strip a two-color job using pin register and masking film. (Job Sheet #8)
16. Expose a blue-line proof. (Job Sheet #9)

STRIPPING PROCEDURES
UNIT VI

INFORMATION SHEET

I. Terms and definitions

A. Stripping — The process of fastening negatives to masking sheets to produce a flat

B. Flat — Negative or negatives attached to masking sheet from which the offset plate is made

C. Masking sheet — Special opaque paper or plastic sheet used to make the flat

(NOTE: Masking sheets can be either ruled or unruled.)

D. Goldenrod — Another name for masking paper; yellow or orange in color

E. Windows — Openings in the masking sheet that expose image areas onto the offset plate

F. Opaque — To prevent light from passing through a material

G. Emulsion side — The side of the film coated with light-sensitive material

H. Pinholes — Small clear areas in the negative which would allow light to pass through if not detected and opaqued

I. Lithographer's tape — Red tape; opaque in nature

J. Rule — A line scribed or scratched on a negative

K. Step-and-repeat — The process of repeating the exposure of a flat several times on an offset plate

(NOTE: The step-and-repeat method of stripping is used for press-run economy by burning a single image on the plate several times to produce many images on each press sheet.)

L. Register — To print the image in the exact same position on each sheet of paper

M. Register marks — Small crosses, guides, or patterns placed on originals and flats to aid registration

N. Pin register — Accurate system of registration using punched negatives, flats, plates, and positioned register pins

O. Main flat — Flat containing the key negatives of a multi-color job

INFORMATION SHEET

P. Complementary flat — A flat containing negatives for only one color or part of a multi-color job

Q. Combination printing — Printing line copy on top of a halftone

(NOTE: Combination printing is also called *surprinting or overprinting.*)

R. Signatures — Usually two, four, eight, or sixteen pages printed on a single sheet to be folded and trimmed as a book or part of a book

S. Imposition guide — A sheet marked to show the page positions

(NOTE: This is commonly referred to as a dummy.)

T. Double burn — Exposing a plate twice using two complementary flats

II. Uses of stripping tools and materials

A. Stripping knife — A single-edged, pointed razor blade, affixed to a handle; used to cut masking sheets and windows

B. Opaque brush or pen — A fine-pointed artist tool used to apply opaquing solution to a negative

C. T-square — Instrument, usually stainless steel or plastic, used to square work on a light table

D. Straight edge ruler — Instrument, usually stainless steel or plastic, used to measure, rule, and cut along an edge

E. Tape dispenser — Holds rolls of tape and contains attached cutting edge

F. Triangles — Metal or plastic 45-45-90 or 30-60-90 degree triangles used to rule and cut along specific lines

G. Scribing tool — A shaped, sometimes looped point with handle for scratching lines on negatives

H. Light table — A table with a frosted glass top and a light underneath to view flats and negatives

I. Magnifier (linen tester) — Magnifying glass mounted on a small frame; used to detect negative flaws

J. Register pins and punches — Used to secure flats and plates for close registration

K. Scissors — Cutting instrument used in trimming

L. Line-up-table — Light table with built-in vertical and horizontal straight edges, calibrated for accuracy

INFORMATION SHEET

M. Goldenrod (masking sheets) — Used to prevent light from reaching the plate

N. Masking tape — Used to tape masking sheets to the light table

O. Lithographer's tape — Used to fasten negatives to the masking sheet and cover large pinholes

P. Opaque solution — Used to cover pinholes and scratches

Q. Amber or ruby peel coat — Peelable film used for stripping multi-color work

III. **Parts on a layout of a typical flat** (Transparency 1)

A. Position of cut-out for gray scale

B. Size of press sheet

C. Final trim size

D. Image positions laid out

E. Image limit

F. Sheet gripper margin

G. Leading edge of plate

H. Wedge cut-out to indicate leading edge of plate

I. Leading edge of press sheet

IV. **The emulsion side and base side of a negative**

A. Emulsion side

1. Coated side which carries the image

2. If scratched, the emulsion comes off, leaving only the clear base, thus allowing light to pass through the negative.

3. Backward or wrong-reading

Emulsion Side Up

INFORMATION SHEET

B. Base side

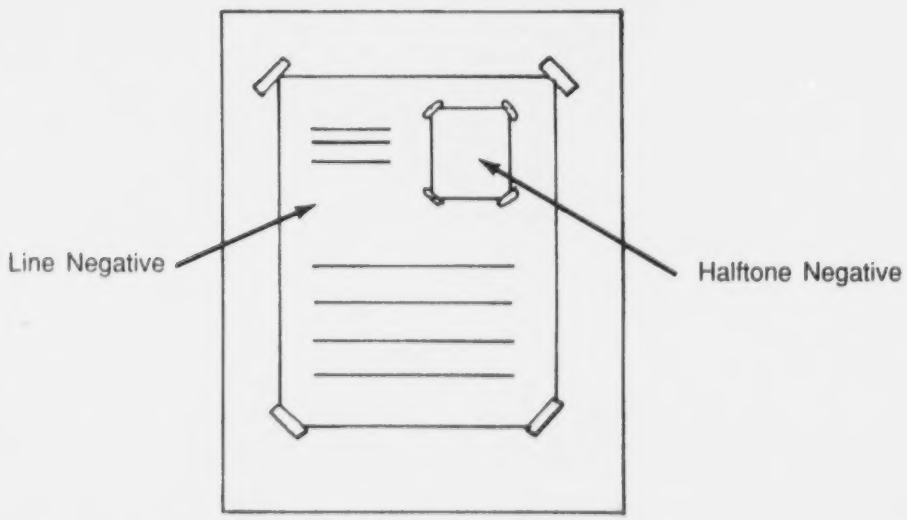
1. Made of a polyester or acetate (plastic) base
2. Coated with a dye which absorbs light and prevents reflection (antihalation coating)
3. Right-reading

Emulsion Side Down

V. Methods of combining line and halftone work

A. Halftone window is cut from red or black material such as paper or masking film, and window is positioned on paste-up.

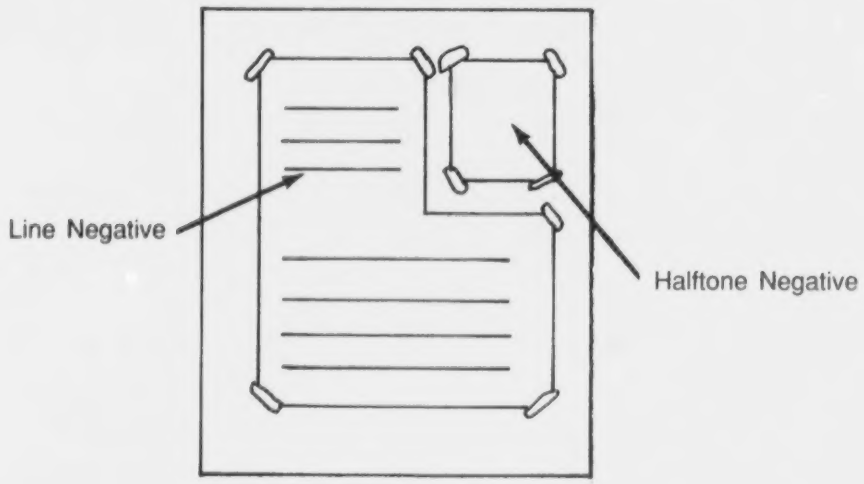
1. Line negative is developed so halftone window remains clear.
2. Halftone negative is stripped into the clear window.



INFORMATION SHEET

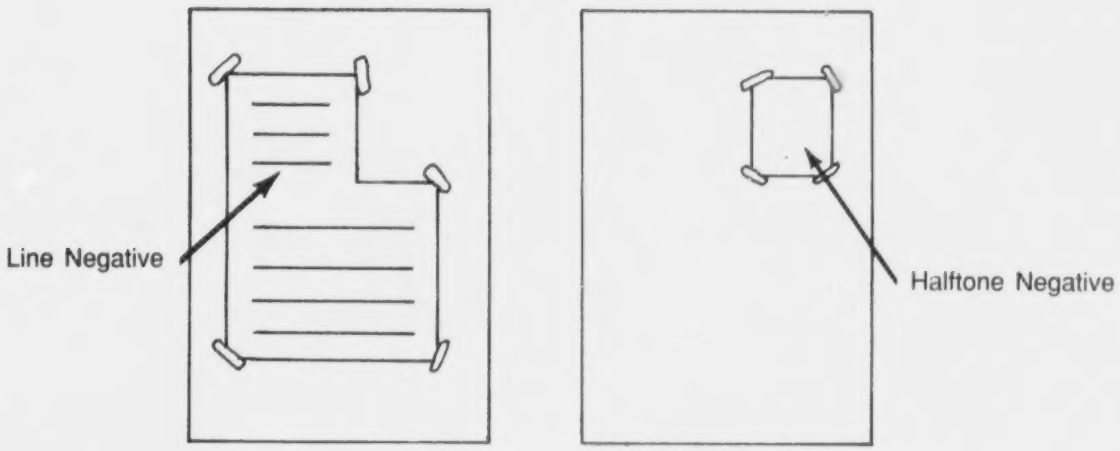
B. Line and halftone negatives are stripped separately to the same flat.

1. Negatives are trimmed and taped into position on the flat.
2. Windows are cut for halftone and line copy in the flat.



C. Negatives are stripped and exposed on separate flats.

1. Line negative is positioned carefully on flat and plate burned.
2. Halftone negative is positioned carefully on second flat and second burn made on plate.



INFORMATION SHEET

VI. Types of combination printing (surprinting or overprinting)

A. Positive lettering printed on top of halftones

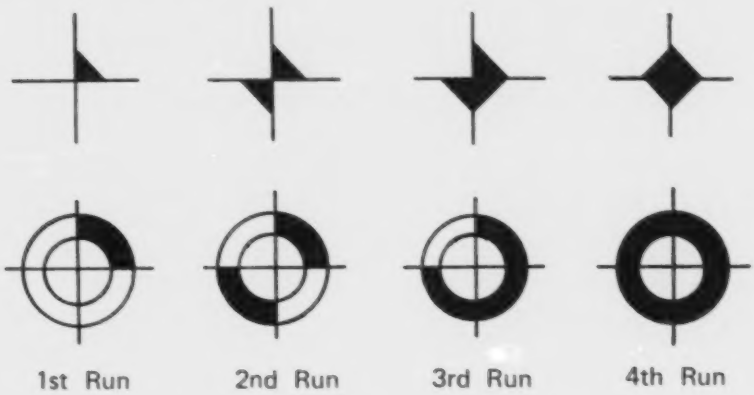
B. Reversed lettering printed on top of halftones (single burn)

VII. Stripping register marks and pins

A. Alignment marks

Common Register Marks Used
for Alignment or Single Runs

B. Multiple printing marks



Register Marks for Multiple Printings

C. Register pins

Round Register Pin

Elongated (or Oval)
Register Pin

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #1—LAY OUT AND STRIP AN UNRULED FLAT (WRONG-READING)

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Masking sheet properly laid out with plate bend line, gripper line and center lines	_____
• Negative properly located on masking sheet with correct emulsion orientation and taped with litho tape	_____
• Window properly opened up over image area, no closer than ¼" to image area	_____
• Imperfections in negative properly opaqued out	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Unruled masking sheet (goldenrod stock)
2. Tape dispenser with masking tape and red lithographer's tape
3. Black fine or medium point ballpoint pen
4. T-square
5. Triangle
6. Printer's line gauge or centering rule
7. Stripping knife or single-edge razor blade
8. Opaque solution and brush or opaquing pen
9. Line negative appropriate for an 8½" x 11" job size

   (NOTE: Instructor may provide you with a negative or he/she may require you to make your own.)
10. Light table

JOB SHEET #1

B. Procedure

(NOTE: Although there are many stripping systems currently used in the graphics industry, the center line stripping method will be used throughout this unit. Two vertical and two horizontal center marks in black ink are placed on the outer edge of the vertical and horizontal center of the copy. When a line negative is made, these four marks show up as tiny clear areas which may be used to position the negative with the vertical and horizontal lines drawn within the page size on the masking sheet.)

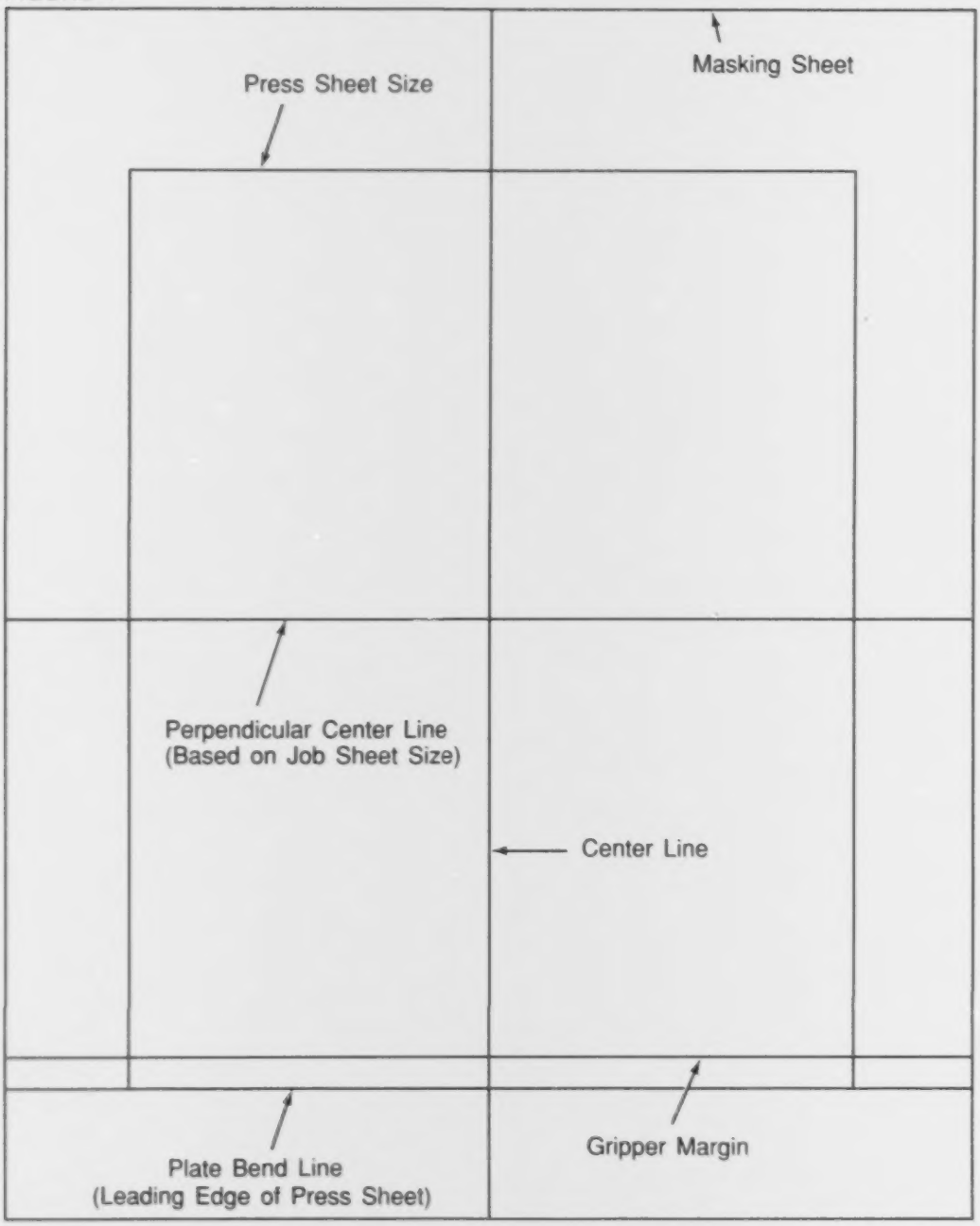
1. Obtain the correct masking sheet size.

2. Position the masking sheet on the light table; check with instructor for orientation of gripper edge.

3. Using the T-square, butt the masking sheet up against blade of T-square to assure masking sheet is squarely aligned.

JOB SHEET #1

FIGURE 1



JOB SHEET #1

4. Using masking tape, tape down the top left and right hand corners of the sheet

   (NOTE: Make sure masking sheet is still square after taping.)

5. Determine the plate bend and measure down from the gripper edge of the masking sheet.

6. Rule across the bend mark on the masking sheet using a ballpoint pen.

   (NOTE: This line represents the top edge of the printed sheet and is also called the paper line. See Figure 1.)

7. Measure down from plate bend the amount of space required for the gripper bite and rule another line parallel to the plate bend line (Figure 1).

8. Measure down 11" (if using an 8½" x 11" sheet) from the line drawn in Step 6 and draw another rule across the sheet (Figure 1).

9. Using the ruler, find the center point perpendicular to the plate bend line.

10. Use the T-square (and triangle, if necessary) to rule the center line (Figure 1).

11. Measure 4¼" (if using an 8½" x 11" sheet) on each side of center line and make mark.

12. Use T-square (and triangle, if necessary) to draw rules on the 4¼" marks.

    (NOTE: These two lines represent the left and right edges of the printed sheet. See Figure 1.)

13. To complete the flat, draw another center line perpendicular to the existing center line. This center line should be one-half the distance of the page size (Figure 1).

14. Position negative emulsion up (backward reading) on the masking sheet so the vertical and horizontal center marks on the negative are in alignment with the center lines on the masking sheet. Double check image alignment on negative to be sure it is square (Figure 2).

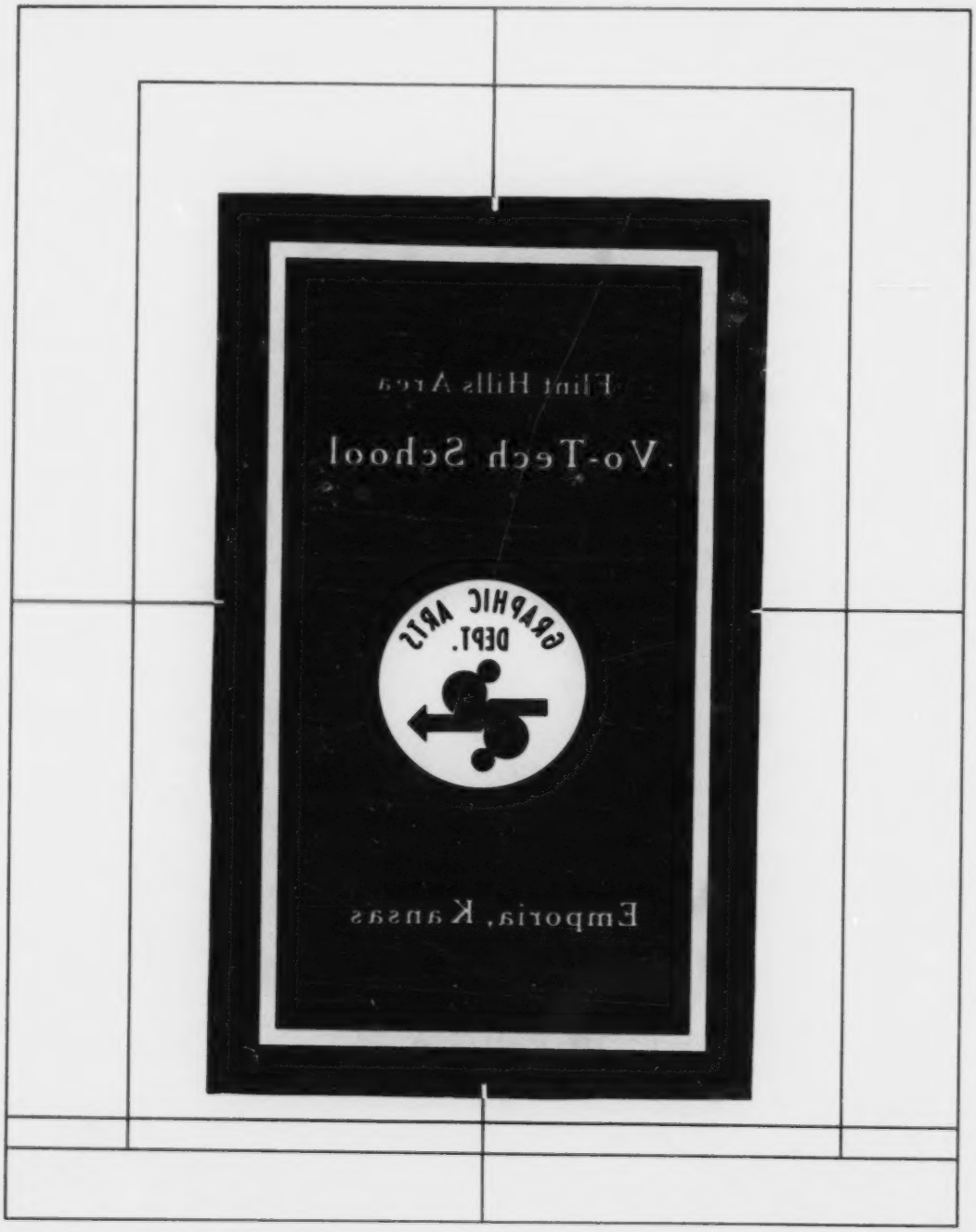
15. Use red lithographer's tape and tape negative to masking sheet by using a small piece of tape in each of the four corners.

16. Remove masking tape from top corners of masking sheet and turn over so negative faces down on light table (image should now be right reading).

17. Turn on light table so image area of negative can be seen through the flat.

JOB SHEET #1

FIGURE 2



JOB SHEET #1

18. Using the stripping knife, cut away masking sheet to expose all of the image area. This is referred to as opening up a window.

    (NOTE: Cut no closer than ¼" to any part of the type or image. Hot spots will occur while platemaking if less than ¼" is allowed.)

19. Use opaque solution and brush (or pen) to cover any imperfection such as a scratch or pinhole that may allow light to pass through the non-image area of the negative.

20. Give completed flat to instructor for evaluation.

21. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #2—STRIP A RULED FLAT (RIGHT READING)

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Negative properly positioned and taped to masking sheet	_____
• Window opened up no closer than ¼" to image area	_____
• Imperfections in negative properly opaqued out	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Tape dispenser
2. Masking tape
3. Lithographer's tape
4. T-square
5. 12-inch ruler
6. Stripping knife
7. Opaque brush and opaque solution
8. Light table
9. Ruled masking sheet
10. Appropriate line negative

JOB SHEET #2

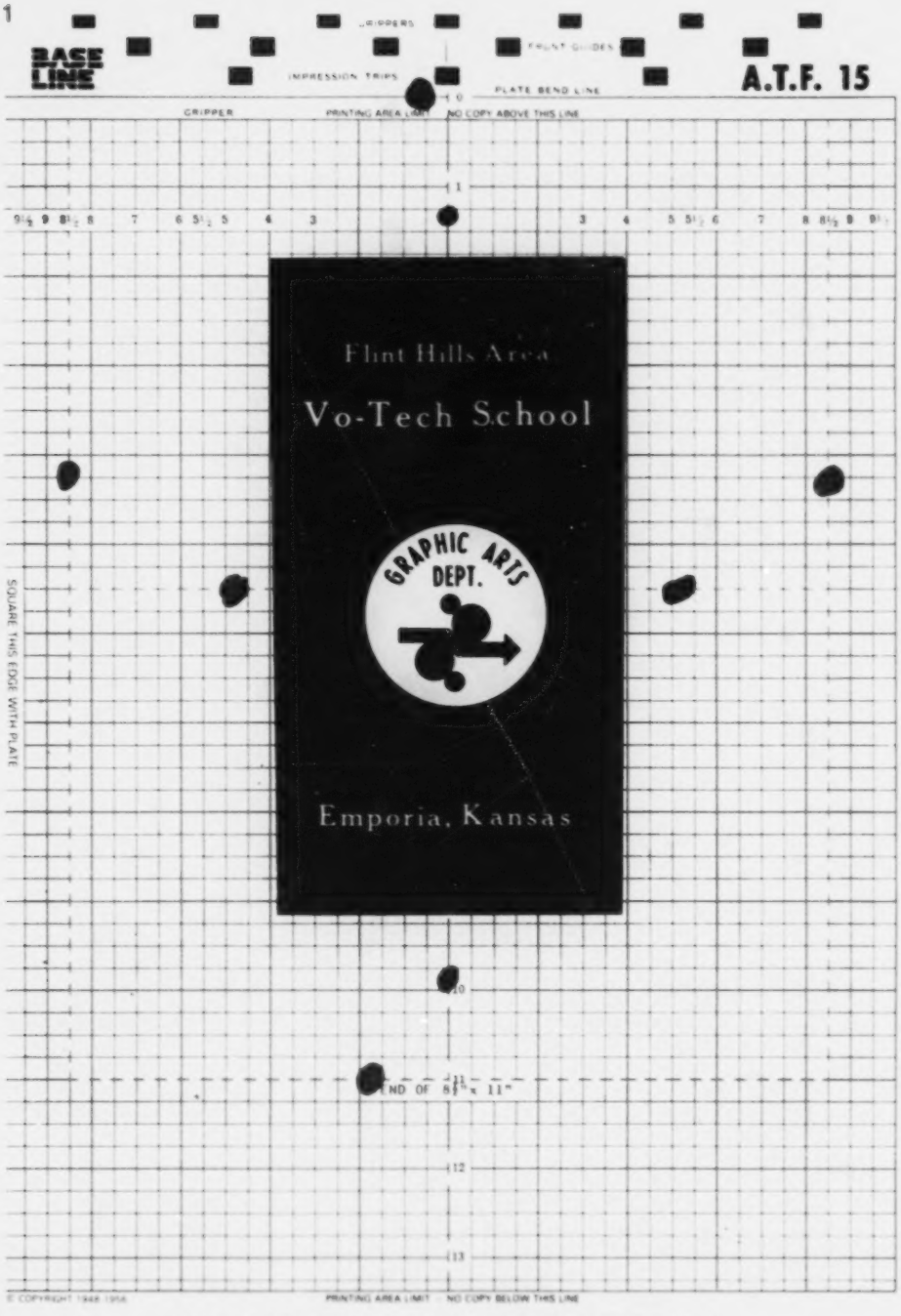
B. Procedure

1. Position masking sheet with gripper margin toward top of light table.
2. Turn on light table.
3. Position line negative under masking sheet and line up center marks on negative with center lines found within the page size identified on masking sheet.
4. Move negative into exact square position by using the vertical and horizontal lines printed on the masking sheet.
5. Hold negative in aligned position with left hand and secure lower right corner to masking sheet with lithographer's tape.
6. Hold negative and masking sheet in aligned position with right hand and secure lower left corner of negative to masking sheet with lithographer's tape.
7. Leave top edge of masking sheet taped to light table, and flip flat over to tape remaining two corners of negative.
8. Flip flat back over and use stripping knife to open image area by cutting masking sheet (Figure 1).

   (NOTE: Do not cut closer than ¼" to the image.)

JOB SHEET #2

FIGURE 1



Base-Line masking sheet used with permission of Base-Line, Inc.

JOB SHEET #2

(NOTE: Figure 1 shows negative stripped to a ruled masking sheet. In this stripping procedure, the negative is positioned underneath the masking sheet emulsion down with the image right reading. Although center marks on the negative are not visible, the same type of image alignment may be used as in Job Sheet #1. The outer four dots represent the page size, the inner four dots represent the vertical and horizontal center lines of the indicated page size. As the negative is slid underneath the masking sheet, the center marks on the edges of the negative are lined up with the center lines on the masking sheet.)

9. Use opaque brush and opaque solution to cover any pinholes or scratches in exposed negative area.

10. Give completed flat to instructor for evaluation.

11. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #3—STRIP FOR STEP-AND-REPEAT

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Negative properly stripped in center line position of masking sheet	_____
• V-shaped notches cut in correct locations	_____
• Imperfections in negative properly opaqued out	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Light table
2. T-square
3. Tape dispenser (with masking tape and lithographer's tape)
4. Stripping knife
5. Opaque brush and opaque solution
6. 10" x 15" ruled masking sheet
7. 2" x 3" trimmed line negative
8. Spare 10" x 15" masking sheet

B. Procedure

1. Using T-square, position 10" x 15" masking sheet square on light table with gripper margin at the top.

   (NOTE: If this position of the gripper edge at the top is maintained throughout the stripping/platemaking process by all personnel, consistent image positioning is better achieved.)

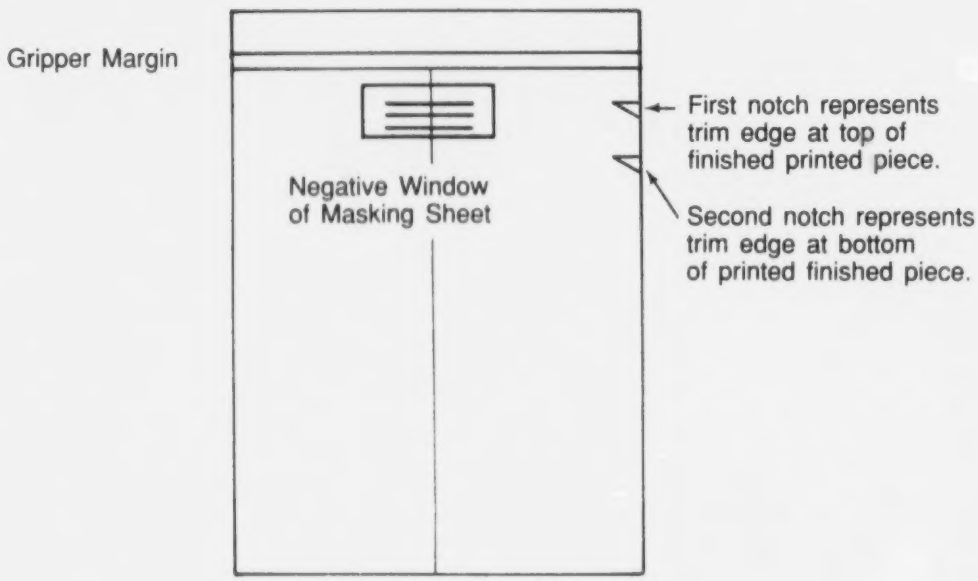
2. Position negative and strip negative in center line position.
3. Check image on negative with T-square to make sure image is square on flat.

JOB SHEET #3

4. Line up T-square with ruled line on masking sheet which represents the top edge of the finished printed sheet.

5. Using the stripping knife, cut a ¼" V-shaped notch in the right side of the masking sheet on the line representing the top edge of the printed finished piece (Figure 1).

FIGURE 1


Gripper Margin
Negative Window of Masking Sheet
First notch represents trim edge at top of finished printed piece.
Second notch represents trim edge at bottom of printed finished piece.

6. Move the T-square down (or to your right on the masking sheet) and line up with the ruled line on the masking sheet representing the bottom edge of the finished printed sheet.

7. Cut a second 1/4" notch on the same right edge of the masking sheet along position of T-square in Step 6 (Figure 1).

8. Use opaque brush and opaque solution to cover any pinholes or scratches in exposed negative area.

   (NOTE: When the first exposure [burn] is completed, the flat is repositioned by matching the #1 notch on the flat with the exposure mark left by notch #2 during the first exposure. An additional masking sheet is placed over the previously exposed part of the plate for each additional exposure. A slight change of color will be noticed where the notch openings were exposed to light during the first burn, which may be removed with deletion fluid or eraser.)

9. Give flat to instructor for evaluation.

10. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #4—COMBINE LINE AND HALFTONE WORK

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Line negative properly stripped to masking sheet	_____
• Halftone negative positioned over window and secured with adhesive	_____
• Masking sheet cut away to expose all images	_____
• Imperfections in line negative opaqued	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Light table
2. T-square
3. Stripping knife
4. Tape dispenser with masking tape and lithographer's tape
5. Line negative with halftone window
6. Halftone negative
7. Appropriate masking sheet
8. Scissors
9. Opaque solution and opaque brush

JOB SHEET #4

B. Procedure

1. Strip line negative to masking sheet.
2. Turn masking sheet over and position halftone negative over windows so ¼" of negative laps over edge of window on all four sides.
3. Make sure the emulsion sides of both the line and halftone negatives are facing up.
4. Spray base side of negative with adhesive. This eliminates the use of tape, which causes hot spots during plating.
5. Cut away masking sheet to expose all images.
6. Opaque any pinholes or scratches on line negative.
7. Turn in completed flat to instructor for evaluation.
8. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #5—STRIP FOR COMBINATION PRINT (DOUBLE BURN)

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Negatives aligned and windows opened up correctly	_____
• Negatives properly registered	_____
• Open register marks covered with lithographer's tape	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Light table
2. T-square
3. Stripping knife
4. Tape dispenser with masking and lithographer's tape
5. 2 line negatives

   (NOTE: One line negative should include typographical material and register marks, the second negative should be a window negative with register marks that correspond with the first negative. The second negative is used as a window for the halftone.)
6. Halftone negative
7. Opaque solution and brush

B. Procedure

1. Obtain necessary negatives.
2. Strip line negative that contains type into position on masking sheet; strip negative underneath flat with emulsion down.
3. Open up mask over register marks and image of line negative.

JOB SHEET #5

4. Register window negative by using register marks.

   (NOTE: This negative will be used for stripping the halftone.)

5. Tape window negative to primary flat with masking tape to maintain register between the two negatives.

6. Align second masking sheet with primary masking sheet and tape into position using masking tape.

7. Attach window negative to second masking sheet using lithographer's tape.

8. Release masking tape and separate primary and secondary flats.

9. Open up window in mask over image area in secondary flat.

10. Do necessary opaquing on both negatives.

11. Turn flat with window over and attach halftone negative (emulsion up).

12. Use red lithographer's tape to cover up any open register marks.

    (NOTE: Register marks for double burning are used primarily for image alignment in stripping and would not normally be exposed to the plate.)

13. Turn in flats to instructor for approval.

14. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #6—STRIP COMPLEMENTARY FLATS FOR MULTI-COLOR PRINTING

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Main flat correctly stripped to expose all lines of type	_____
• Lines marked for first and second colors	_____
• Second masking sheet stripped to expose all lines in first color and labeled	_____
• Third masking sheet stripped to expose all lines in second color and labeled	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Light table
2. T-square
3. Stripping knife
4. Tape dispenser with masking and lithographer's tape
5. Line negative (image area appropriate for two-color printing)
6. Three 10" x 15" masking sheets
7. Black felt tip pen
8. Opaque solution and brush or opaquing pen

B. Procedure

1. Strip line negative to masking sheet.
2. Using stripping knife, cut away masking sheet exposing all lines of type on negative; opaque negative to eliminate imperfections.

JOB SHEET #6

3. Using black pen, mark which lines of type are to be printed in first and second colors.

4. Tape second masking sheet over stripped flat and cut away masking sheet to expose all lines to print in first color.

5. Identify masking sheet cut in Step 4 as first color (name color).

6. Tape third masking sheet to first flat and cut away masking sheet to expose all lines of second color.

7. Identify third masking sheet cut in Step 6 as second color (name color).

8. Identify first flat as main flat.

   (NOTE: A color proof may be made using acetate overlay proofing material. Burn the first color by placing the first mask over the main flat. Burn the second color by placing the second mask over the main flat.)

9. Turn in main and complementary flats to instructor for evaluation.

10. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #7—LAY OUT SIGNATURE FLATS FOR MULTI-PAGE OR BOOK PRINTING

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Imposition guide correctly folded and numbered	_____
• Masking sheets correctly marked	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

(NOTE: Instructor may enlarge on this job sheet to include 16 or 32-page signatures and either saddle stitch or side bound formats.)

A. Equipment and materials

1. Light table
2. T-square
3. Stripping knife
4. Tape dispenser with clear tape and lithographer's tape
5. Blank sheet of paper, size 11" x 17"
6. Two 11" x 17" masking sheets
7. Black felt tip pen

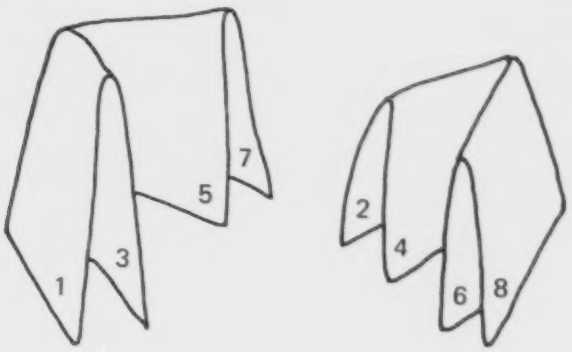
JOB SHEET #7

B. Procedure

1. Fold the 11" x 17" sheet in half and then into a quarter fold.

2. Holding folded edges at left and top, number lower right corner of sheets from 1 through 8 (Figure 1).

FIGURE 1

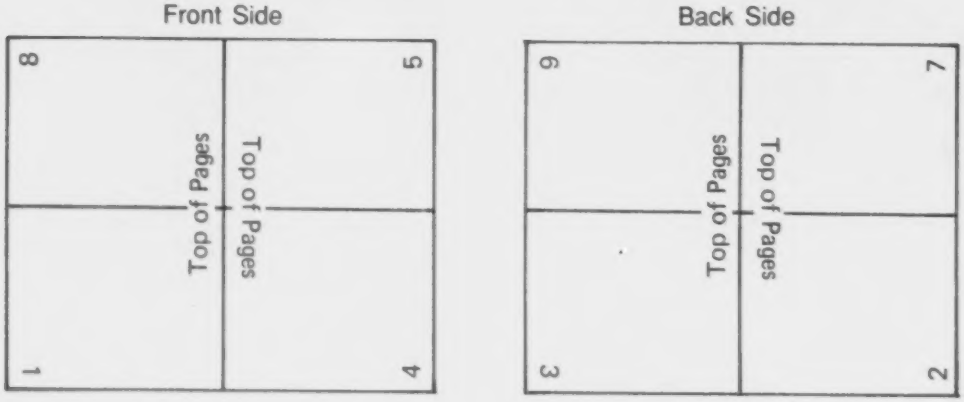


3. Unfold the marked sheet, now called an imposition guide.

(NOTE: Be sure to have instructor show you how to identify the gripper edge and side guide as it relates to a particular press and folding machine.)

4. Mark the two masking sheets using the imposition guide (Figure 2).

FIGURE 2



5. Turn in the imposition guide and marked sheets to the instructor for evaluation.

6. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #8—STRIP A TWO-COLOR JOB USING PIN REGISTER AND MASKING FILM

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Masking sheet and peel coat correctly punched	_____
• Negative correctly stripped to masking sheet	_____
• Peel coat accurately registered and cut away for two colors	_____

Introduction: This exercise will familiarize the student with the fundamentals of layout stripping procedures and provide an introduction to the use of stripping tools and supplies.

A. Equipment and materials

1. Register punch
2. Two register pins
3. Masking sheet
4. Stripping knife
5. Negative for two-color job
6. Light table
7. Opaquing solution and brush
8. Amber or ruby peel coat (two sheets same size as masking sheet)
9. Tape dispenser with masking tape and red lithographer's tape

B. Procedure

1. Using register punch, punch masking sheet and peel coat film on the gripper edge.
2. Place masking sheet on light table and strip negative into position.
3. Fit register pins into holes punched in masking sheet.
4. Tape tabs of register pins to glass top of light table using masking tape.

JOB SHEET #8

5. Using the stripping knife, open up the mask over the image area.
6. Register punched peel coat masking film to pins.
7. Using stripping knife, cut outline of area to be printed in the primary color, cutting through peelable membrane only.
8. Peel away the colored film from the image area to be printed in the primary color.
9. Remove masking film from pins.
10. Get second piece of masking film and repeat steps 6 through 9.
11. Give stripped flat and two-color break masks to instructor for evaluation.
12. Clean work area and return equipment and materials to proper storage.

STRIPPING PROCEDURES
UNIT VI

JOB SHEET #9—EXPOSE A BLUE-LINE PROOF

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Exposure correctly made	_____
• Proof image accurately registered	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a blue-line proof in shops where such proofs are used.

A. Equipment and materials

1. Vacuum printer
2. Register pins
3. Register punch
4. Blue-line proofing material

   (NOTE: Some blue-line proofing materials require the use of an exposing filter for obtaining a high quality blue image. The purpose of the filter is to help balance the exposing light source to the emulsion sensitivity of the proofing material.)

B. Procedure

1. Obtain necessary stripped flats for making a combination print.
2. Obtain appropriate piece of blue-line proofing material.
3. Punch proofing material and position on pins.
4. Register first flat on the pins for exposure to the proofing material.
5. Make exposure (check with instructor).
6. Remove primary flat from pins and place secondary flat on pins.
7. Make exposure.
8. Remove secondary flat.

JOB SHEET #9

9. Check proof for image registration.
10. Give flats and exposed proof to instructor for evaluation.
11. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

UNIT OBJECTIVE

After completion of this unit, the student should be able to determine the correct plate exposure and make required plates for single and multiple color jobs when using line negatives and/or screens and halftones. Competencies will be demonstrated by completing the job sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to platemaking procedures with their correct definitions.
2. Identify types of plate ends.
3. Match types of offset plates with their correct characteristics.
4. Identify plate exposing devices.
5. Match types of presensitized plates with their characteristics.
6. Select true statements concerning the gumming of plates.
7. Select true statements concerning handling and storing plates.
8. Select true statements related to the do's and don'ts for properly handling plates and chemicals.
9. Expose and develop a subtractive plate. (Job Sheet #1)
10. Determine plate exposure using a step-off test. (Job Sheet #2)
11. Expose a step-and-repeat plate. (Job Sheet #3)
12. Expose a plate when using a screen tint. (Job Sheet #4)
13. Make plates for a two-color job. (Job Sheet #5)
14. Expose a photo-direct plate. (Job Sheet #6)

PLATEMAKING PROCEDURES
UNIT VII

INFORMATION SHEET

I. Terms and definitions

A. Grained plate — A plate where tiny pits or indentations in the surface of the plate allow it to carry water

B. Smooth plate — A plate whose surface is grainless

C. Process gum/desensitizer — A solution used to desensitize an additive plate

(NOTE: Manufacturers have different processes. Use recommended chemistry with plate.)

D. Light-sensitive coating — Diazo compound or photopolymer which, after exposing and processing, creates image area on plate

E. Gum arabic — Solution used to preserve plate and protect surface from oxidation

(NOTE: Many plate manufacturers use a finisher/desensitizer in lieu of gum arabic.)

F. Surface plate — A plate in which the image and non-image areas are level; may be exposed from either a negative or positive film flat depending on plate coating

G. Deep-etch plate — A plate in which the image is etched slightly below the surface; exposed from a flat composed of film positives

H. Squeegee — A smooth rubber blade used to wipe moisture from plate surface

I. Ink-receptive — Areas on plate which accept and hold ink and reject water

J. Ink-repellent — Areas on plate which accept and hold water and reject ink

K. Gray scale (sensitivity guide) — A commercially produced sensitivity guide with a 12-step negative representing the various tones from white to black; used by platemakers to determine plate exposure

L. Halo — A shadow around the edge of a halftone created by improper stripping or platemaking procedures

M. Dot — The individual element of a halftone

N. Dot loss — Disappearance of a dot from the plate

INFORMATION SHEET

O. Dot spread — Dot enlargement on the plate

(NOTE: This is commonly referred to as dot gain.)

P. Broken image — An incomplete image on the plate

Q. Blind — An imaged plate surface that will not accept ink

R. Hone — An abrasive stone used to remove unwanted marks on the plate surface

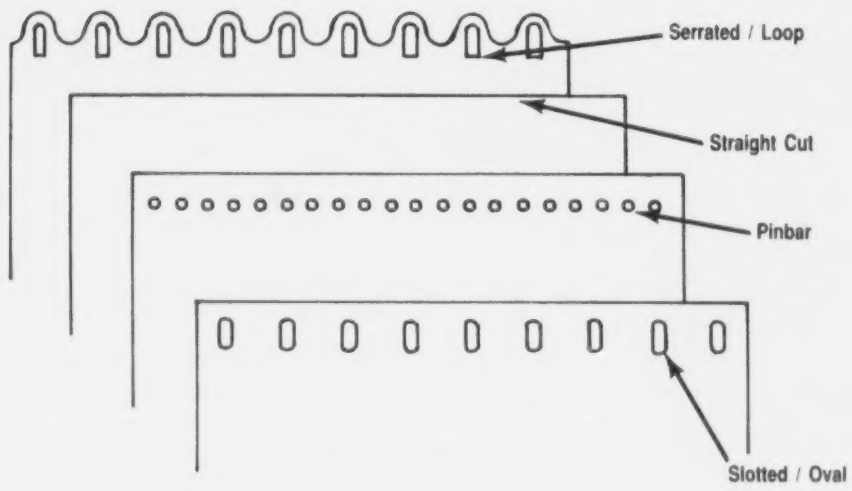
S. Lacquer — Solution used for hardening the image area of an additive plate

T. Deletion fluid — A solution used to eliminate plate flaws or unwanted image areas

U. Image-add pen — A fiber-tip pen used to repair broken images on the plate surface

V. AGE (asphaltum gum etch) — Protective gum storage chemical typically used on plates that need to be stored for a long period of time

II. **Types of plate ends** (Transparency 1)



INFORMATION SHEET

III. Types of offset plates and their characteristics

A. Surface

1. Presensitized – Light-sensitive coating is applied during plate manufacturing.

2. Photodirect – Made directly in automatic platemakers making intermediate step (flat) unnecessary.

   (NOTE: These commonly come in roll form.)

3. Wipe-on – Light-sensitive coating is applied in shop immediately before exposure.

4. Electrostatic – Image is produced on plate surface by an electrostatic charge.

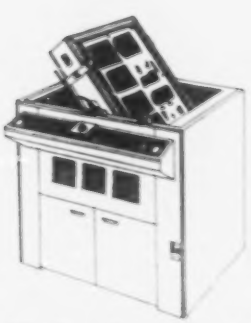
5. Direct-image – Has no sensitized coating; image is accomplished by typing or hand lettering.

   (NOTE: The direct-image plates are often called *masters*.)

B. Deep-etch – Image area chemically etched to a depth slightly below non-printing area; common types are single metal and multimetal.

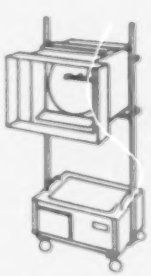
IV. Plate exposing devices (Transparencies 2 and 3)

A. Vacuum frame – Holds flat and plate in close contact



Flip-Top Exposing Unit

Overhead Exposing Unit



Stand-Alone Exposing Unit
(Used with stand-alone vacuum printer for exceptionally large offset plates)

Courtesy of Burgess Industries, Inc., Plymouth, Minnesota

INFORMATION SHEET

B. Light sources

Pulsed-Xenon Light (Helical Type)

Courtesy of Burgess Industries, Inc., Plymouth, Minnesota

Carbon-Arc Light

Mercury Vapor or Metal Halide Lamp

Courtesy of Burgess Industries, Inc., Plymouth, Minnesota

(NOTE: Carbon arc is the oldest and least used of the available light sources. It is found only in flip-top and stand-alone units. The other two light sources may be found in any of the three types of exposure units.)

V. Types of presensitized plates and their characteristics

A. Additive-working – A special ink-holding coating is added during plate developing process

B. Subtractive-working – Have a factory applied synthetic lacquer coating which is removed during development

C. Negative-working – Produce an image area in all places on the plate that are struck by light during exposure

D. Positive-working – Produce an image area in all places on the plate not struck by light during exposure

VI. Gumming of plates

A. After applying gum arabic or other recommended finisher to plate, the surface should be buffed totally dry with sponge or cotton pad.

B. Both sides of plate should be buffed totally dry before hanging up.

C. Hang up plates in such a way that one plate does not lie against another.

D. If plate has been run, clean both sides before gumming.

E. AGE should be used to gum plates for long-term storage.

INFORMATION SHEET

VII. Handling and storing plates

(NOTE: Do not contaminate the plates with any foreign matter; use only approved chemicals and handling procedures.)

A. Handling

1. Pick up plates at ends using only thumb and index finger.

   (CAUTION: Avoid sliding fingers along plate edges as they are sharp.)

2. Avoid touching plate surfaces with fingers before and after processing.

3. Lift plates by opposite corners to avoid crimping or scratching.

B. Storing

1. Be certain all plates are clean and dry before storing.

2. Store plates in vertical hanging envelopes if possible.

3. Protect plates stored in flat drawers with folders.

4. Store unexposed presensitized plates in cool, dry area away from light and do not remove until ready for exposure.

VIII. Do's and don'ts for properly handling plates and chemicals

A. **Do** handle sharp edged plates carefully.

B. **Do** raise, rotate, and close vacuum frame slowly and carefully.

C. **Do** shake chemicals well before using.

D. **Do** pour chemicals slowly.

E. **Do** store chemicals in properly marked, tightly closed containers.

F. **Do** read and use recommended HMIS handling procedures when using plate processing chemicals.

G. **Do not** handle electrical platemaking equipment with wet hands.

H. **Do not** lean on glass-topped vacuum frame.

I. **Do not** breathe chemical fumes.

J. **Do not** look directly at light sources.

(CAUTION: Do not wear contact lenses when working in arc platemaking area.)

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #1—EXPOSE AND DEVELOP A SUBTRACTIVE PLATE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Plate properly exposed based on manufacturer's recommendations	_____
• Plate correctly developed, rinsed, gummed and buffed dry to provide an ink receptive image area and a water receptive nonimage area	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a plate and using necessary equipment and chemicals to develop the plate.

A. Equipment and Materials

1. Plate exposure device
2. Glass cleaner and wipes
3. Presensitized subtractive plate (negative-acting)
4. Plate developing sink or table
5. Plate processing chemicals

   (NOTE: Plate processing chemicals usually consist of a developer and a finisher for subtractive plates; be sure to follow manufacturer's recommendations for use.)

6. Sponge or pad applicator for developer
7. Squeegee
8. Sponge or cotton litho pads for finisher
9. Cotton pads for buffing plate dry
10. Paper pad

    (NOTE: Pad should be slightly larger than largest plate size used. Sheets of newsprint work nicely for making pads.)

JOB SHEET #1

B. Procedure

(NOTE: All plate handling including exposing and processing should be done in a yellow light environment if possible to avoid excessive exposure to UV light.

1. Clean sink area. Arrange chemicals and other materials in an orderly fashion to facilitate plate processing procedure.

2. Check developing pad applicator to be sure it is clean and free of excessive moisture.

3. Clean glass on vacuum printer.

4. Make plate exposure.

5. Place plate in developing sink and pour a liberal amount of developer over plate surface.

6. Use developer applicator to spread chemical over plate surface.

7. Allow chemical to set for 10 to 15 seconds.

   (NOTE: This dissolves the unexposed coating.)

8. Finish developing plate using pad applicator in a figure-8 motion, being sure to cover entire surface area of plate.

9 Check any screens and halftones closely to assure they are properly cleaned out.

10. Flush plate with water to remove excess developer and dissolved light-sensitive coating.

11. Squeegee excess moisture from plate surface and place plate on a pad of absorbent paper.

12. Apply a thin uniform coating of finisher/desensitizer to the plate surface using vertical and horizontal strokes.

    (NOTE: This final protective coating should be rubbed into the plate surface for 15 to 20 seconds for each square foot of plate surface area.)

13. Buff both sides of plate totally dry.

14. Give finished plate to instructor for evaluation.

15. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #2—DETERMINE PLATE EXPOSURE USING A STEP-OFF TEST

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Flat aligned properly on offset plate	_____
• Gray scale properly masked	_____
• Plate properly exposed based on manufacturer's recommendations	_____
• Plate correctly developed, rinsed, gummed and buffed dry to provide an ink receptive image area and a water receptive nonimage area	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a plate according to a gray scale comparison and using necessary equipment and chemicals to develop the plate.

A. Equipment and materials

1. 10" x 15" masking sheet
2. Platemaker's continuous tone 12- or 21-step transparent gray scale
3. Stripping knife
4. Red lithographer's tape
5. Light table
6. Plate exposing and processing equipment (Refer to Job Sheet #1.)

B. Procedure

1. With the aid of a light table and stripping knife, cut out gray scale size section of mask slightly back from leading edge of masking sheet.
2. Position gray scale in cut out section of masking sheet and attach on both ends using small pieces of red lithographer's tape.

JOB SHEET #2

3. Position flat on offset plate in vacuum frame of platemaker with the plate emulsion facing up and the emulsion side of the gray scale facing down in contact with the plate.

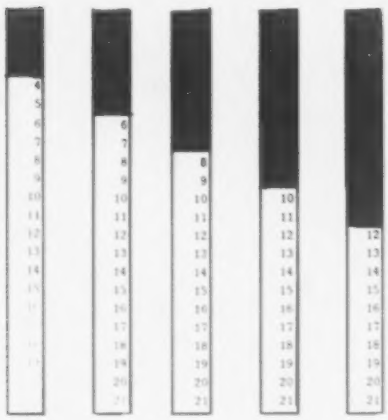
4. Close vacuum frame, lock, and turn on vacuum.

5. Check vacuum pressure.

   (NOTE: When vacuum pressure is at a sufficient level, plate is ready for the first exposure. Ask your instructor to explain the concept of Newton's Rings to determine vacuum pressure.)

6. Make a step-off exposure (Figure 1)

FIGURE 1: Exposed gray scale



Courtesy Stouffer Graphic Arts Equipment Company.

a. Make first exposure of 15 seconds.

b. Release vacuum, move flat down about 1 inch and cover up uncovered area of the plate with another masking sheet.

c. Make second exposure of 30 seconds.

d. Repeat step b.

e. Make third exposure for 45 seconds.

JOB SHEET #2

f. Repeat step b.

g. Make fourth exposure for 60 seconds.

h. Repeat step b.

i. Make fifth exposure at 90 seconds.

7. Process plate (See Job Sheet #1).

   (NOTE: Check plate manufacturer's recommendations for correct step on gray scale. Making a 5-step step-off test as previously described will usually yield an exposure that will provide the recommended step on the gray scale. If not, the test may simply be redone using different exposure numbers.)

8. Give plate to instructor for evaluation.

9. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #3—EXPOSE A STEP-AND-REPEAT PLATE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Flat aligned properly on offset plate	_____
• Plate properly exposed; notches in register	_____
• Plate correctly developed, rinsed, gummed and buffed dry to provide an ink receptive image area and a water receptive nonimage area	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a step-and-repeat plate and using necessary equipment and chemicals to develop the plate.

A. Equipment and materials

1. Flat stripped for step-and-repeat

   (NOTE: Use flat prepared for Job Sheet #3 in Unit VI, "Stripping Procedures.")

2. 10" x 15" masking sheets
3. Plate exposure device
4. Glass cleaner and wipes
5. Presensitized subtractive plate (negative-acting)
6. Plate developing sink or table
7. Plate processing chemicals
8. Sponge or pad applicator for developer
9. Squeegee
10. Sponge or cotton litho pads for finisher
11. Cotton pads
12. Paper pad

JOB SHEET #3

B. Procedure

(NOTE: Although this procedure is valid, and used by many shops, other shops strip multiple negatives on a common flat, avoiding the need for multiple plate burns.)

1. Position flat on presensitized plate.
2. Make first exposure (burn).
3. Reposition flat for second exposure (burn) by matching first notch on flat with exposure mark on plate left by second notch.
4. Place masking sheet over exposed portion of plate.
5. Make second exposure.
6. Repeat procedure until number of desired images are exposed on plate.

   (NOTE: Make certain edge of plate and flat are aligned perfectly for each exposure. Place an additional masking sheet over exposed part of the plate for each additional exposure.)
7. Develop plate.
8. Rinse plate and squeegee off excess moisture.
9. Place processed plate on pad of absorbent paper.
10. Apply finisher/desensitizer (gum).
11. Buff plate dry on both sides.
12. Give plate to instructor for evaluation.
13. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #4—EXPOSE A PLATE WHEN USING A SCREEN TINT

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Screen properly stripped in	_____
• Flat aligned properly on offset plate	_____
• Plate properly exposed	_____
• Plate correctly developed, rinsed, gummed and buffed dry	_____
• Screen tint dots properly developed and cleaned to avoid plugging	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a plate using a screen tint and using necessary equipment and chemicals to develop the plate.

A. Equipment and materials

1. Flat acceptable for screening portion of image (see instructor)
2. Light table
3. Screen tint (line ruling and percentage optional)
4. Red lithographer's tape
5. Scissors
6. Offset plate
7. Processing chemicals and supplies
8. Vacuum exposing unit

JOB SHEET #4

B. Procedure

1. Lay flat on light table emulsion side up.
2. Identify area to be screened.
3. Use scissors to cut a piece of screen tint 1/4" larger on all four sides than area to be screened.
4. Tape screen (emulsion up) over image area making sure of total coverage with overlap on all sides.

   (NOTE: using litho tape, attach screen to negative on two sides, keeping tape as far away from image as possible to avoid the possibility of halation.)
5. Position plate in vacuum exposing unit and position flat on plate with image right reading and the emulsion of the screen tint in direct contact with the plate surface.
6. Close vacuum frame and expose plate.
7. Process plate (see Job Sheet #1).
8. Check screen to see that it is properly cleaned out.
9. Give plate to instructor for evaluation.
10. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #5—MAKE PLATES FOR A TWO-COLOR JOB

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Register holes properly cut or punched	_____
• Flat aligned properly on offset plate	_____
• Multiple image flats are in register	_____
• Plate correctly developed, rinsed, gummed and buffed dry	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a plate that must remain in register and using necessary equipment and chemicals to develop the plate.

A. Equipment and materials

1. Flats stripped for two-color job

   (NOTE: Use flats prepared for Job Sheet #6, Unit VI, "Stripping Procedures.")

2. Vacuum exposing unit

3. Processing chemicals and supplies (See Job Sheet #1.)

   (NOTE: If available, pin register system may be used to register main flat with color break masks and offset plates.)

B. Procedure

1. Cut 1/4" triangle in all three masking sheets in area above gripper margin.

   (NOTE: Use register punch if available.)

2. Cover triangle openings with small strips of lithographer's tape.

   (NOTE: This procedure is used only when not using register punch.)

3. Position main flat on the first plate.

4. Register first color flat over main flat.

JOB SHEET #5

5. Make first plate exposure.
6. Position main flat on the second plate.
7. Register second color flat over main flat.
8. Make second plate exposure.
9. Process plates (See Job Sheet #1).
10. Present plates to instructor for evaluation.
11. Clean work area and return equipment and materials to proper storage.

PLATEMAKING PROCEDURES
UNIT VII

JOB SHEET #6—EXPOSE A PHOTO-DIRECT PLATE

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Copy positioned properly to maintain squareness of image	_____
• Plate correctly exposed containing entire image, good contrast, and no flaws, scratches or spots	_____

Introduction: This exercise will familiarize the student with the procedures of exposing a photo-direct plate, a process used in many shops.

A. Equipment and materials

1. Photo-direct platemaker
2. Photo-mechanical copy (paste-up or original)
3. Glass cleaner
4. Paper towel

B. Procedure

1. Clean copy frame glass.
2. Position photo-mechanical copy (paste-up or original) in copy frame.
3. Set percentage (100%) on copy frame.
4. Set percentage (100%) on control panel.
5. Set plate length (13-14").
6. Set exposure dial S x 10 and 1.5 = 15 seconds.

   (NOTE: Assume this is the normal exposure.)
7. Press exposure button.
8. When plate comes out (approximately 90 seconds) check to make sure entire image is on plate.

   (NOTE: Compare plate with original copy.)

JOB SHEET #6

9. Check contrast between image and background.
10. Check for flaws, scratches, and spots.
11. Correct exposure.
    a. If copy and background are dark, lengthen exposure by 2 seconds.
    b. If copy is light, shorten exposure by 2 seconds.
12. Turn in final plate to instructor for evaluation.
13. Clean work area and return equipment and materials to proper storage.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

UNIT OBJECTIVE

After completion of this unit, the student should be able to explain the differences in the flow of prepress activity in a computer-to-plate, or a computer-to-press operation, and address the fundamental changes in staffing needs and operating procedures taking place because of this technology. Competencies will be demonstrated by completing the assignment sheets, job sheet, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to digital printing with their correct definitions.
2. Select types of digital printing systems.
3. Distinguish among three types of computer-to-plate printing systems.
4. Explain unique capability of computer-to-print systems.
5. List three technologies using computer-to-print engineering.
6. Compare and contrast a conventional printing operation to a digital printing operation.
7. Collect current event material concerning changes in staffing and training needs for personnel in the printing industry. (Assignment Sheet #1)
8. Compare and contrast the changes in staffing and training needs in a typical print shop which adopts CTP technology. (Assignment Sheet #2)
9. Analyze the effects of digital technology on the printing industry as it applies to the printer's and the customer's viewpoint of cost, customer service and competitiveness. (Assignment Sheet #3)
10. Create a camera-ready laser copy of a page containing text, graphics and headlines using instructor-supplied hardware, and desktop publishing software. (Job Sheet #1)

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

INFORMATION SHEET

I. Terms and definitions

A. CTP—Computer-to-plate or Computer-to-print; technology which allows the operator of a desktop publishing terminal to output a digitized document directly to a platemaker, press or other printing device

B. Desktop publishing (DTP)—Using a personal computer, appropriate software, and an output device to combine text and graphics to produce a document

C. Digital imaging—The product of imagesetting equipment in fully composed pages

D. Digital printing—A system using a number of computer and electronic technologies to integrate color separation, correction, retouching, page makeup, text editing and imposition—without the use of intermediate film steps

E. Direct imaging—The use of digitized files to drive equipment which produces reproductions directly on the substrate without the need for intermediate films or plates

F. Imagesetter—A machine combining the functions of a printer, recorder and RIP which is capable of outputting a fully composed page to a platemaker, press or other printing device

G. RIP—Raster image processor; a device which encodes a computer's page description language into bit maps (or graphics cues) used by an image setting machine

H. Trapping—(In prepress) The degree to which overprinting colors overlap to eliminate white lines between colors in printing

II. Types of digital printing systems

A. Computer-to-plate—Systems which use digital information to create a printing plate directly, without the use of intermediate films

B. Computer-to-print—Systems which use digital information to control electro-photographic, ionographic, magnetographic, ink-jet or thermal transfer imaging to produce reproductions directly, without the use of intermediate films or plates

INFORMATION SHEET

III. **Computer-to-plate printing systems**

A. Plates or image carriers for gravure and flexography on which images can be produced by etching the surface with lasers or electromechanical engraving devices

B. High-speed light-sensitive plates for lithography coated with emulsion to be exposed by low-power visible lasers

C. Non-light-sensitive plates for lithography coated with emulsion on which images can be exposed by heat rather than light

IV. **Computer-to-print capability**--Computer-to-print systems are derivatives of electrostatic copying machines in which the image recorded must be repeated for each impression. Because of this, these systems are capable of printing variable information from impression to impression—depending upon digital information stored in the driving computer. All go directly from an imagesetter to a press-like device without intermediate films or plates.

V. **Technology using computer-to-print systems**

A. Electronic printers

B. Color copiers

C. Electronic printing systems

(NOTE: Although computer-to-print systems are designed specifically for so-called "short run" jobs, such systems are increasingly useful for publishing trade journals, etc., tailored specifically to individual readers and advertisers in press runs of 100,000 or fewer.)

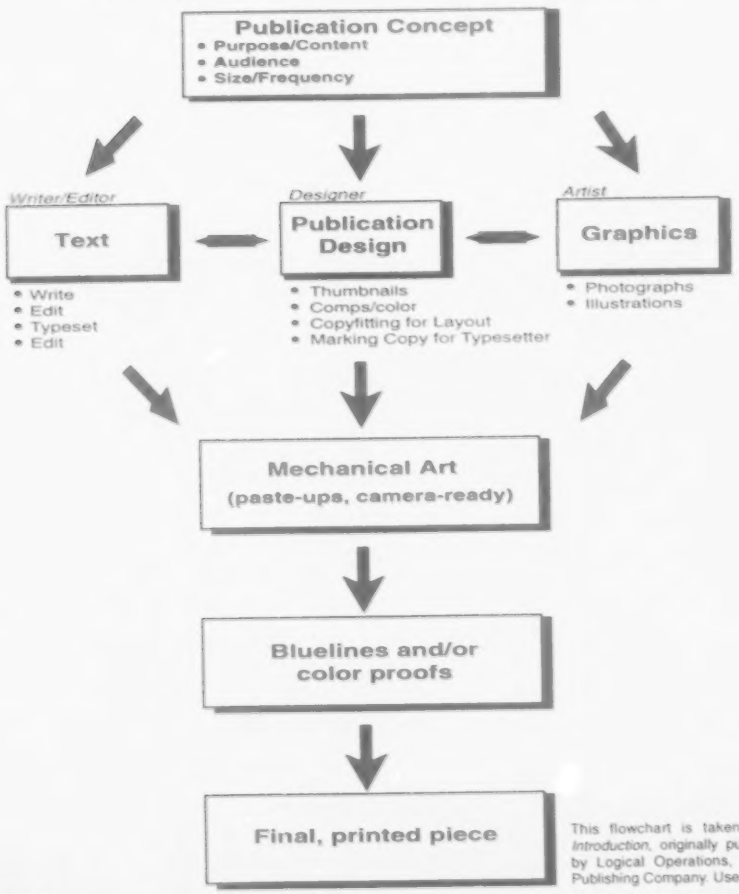
INFORMATION SHEET

VI. Traditional printing vs. digital printing

A. Traditional Printing

1. Publication Concept—purpose/content, audience, size/frequency
2. Text—write, edit, typeset, edit
3. Publication design—Thumbnails, comps/color, copyfitting for layout, marking copy for typesetter
4. Graphics—Photographs, illustrations
5. Mechanical art—paste-ups of text, and graphics, camera ready
6. Bluelines and/or color proofs
7. Final, printed piece

Overview of Traditional Publishing



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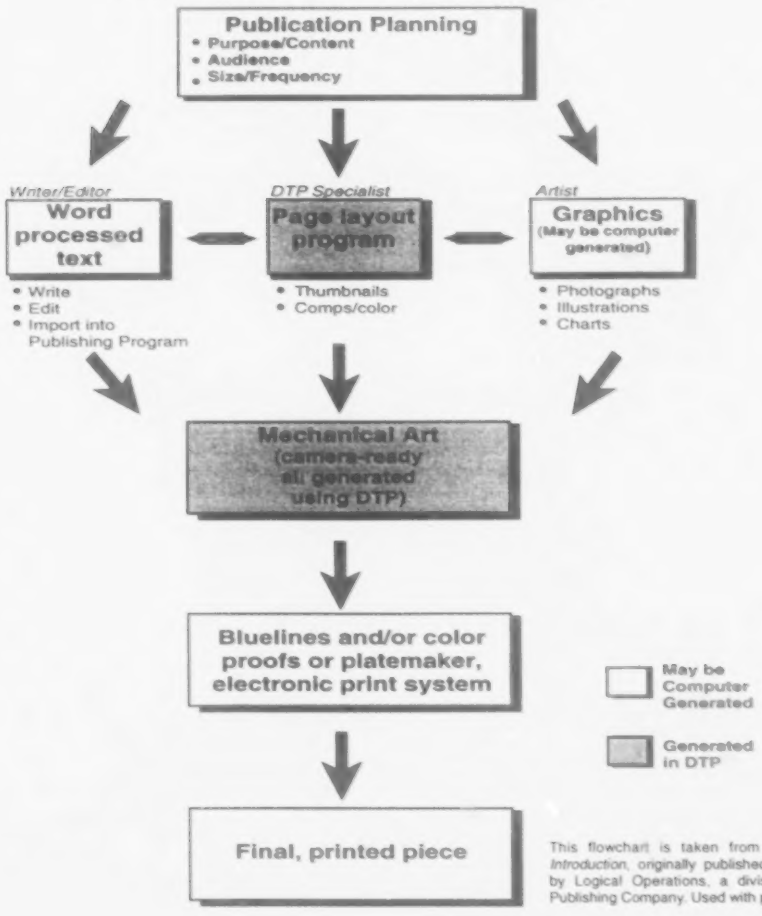
INFORMATION SHEET

B. Digital Printing

1. Publication Concept—purpose/content, audience, size/frequency
2. Word processed text—write, edit, import into publishing program
3. Page layout program—thumbnails, comps/color
4. Graphics—(may be computer generated) photographs, illustrations, charts, imported into publishing program
5. Mechanical art—camera ready, all generated using publishing program
6. Bluelines and/or color proofs
7. Final, printed piece

Overview of Desktop Publishing



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DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

STUDENT SUPPLEMENT 1—OVERVIEW OF DIGITAL HISTORY IN PRINTING

Although the process of printing has undergone a steady technological evolution since it was introduced to the western world in the middle 1400s in the form of Gutenberg's movable type, the pace with which the process and industry is changing today is astounding.

From Gutenberg's time, printing remained a manual craft using hand-cast or cut letters, hand-set type and hand-operated presses for roughly 350 years. By 1800 the Industrial Revolution had begun to bring changes to printing, and lithography and photography combined by 1840 to produce photoengraving. By 1893 three-color printing was practical and printing, as a process, remained relatively unchanged until the 1950s, with the introduction of electronics which led to computers, phototypesetting and electronic scanners. In fact, had Gutenberg traveled forward in time to 1950, he would have been able to set type by hand from a typecase and pull a proof on a proof press—much the same way he would have 500 years earlier!

By 1980, however, digital image processing was being seen as a tool to eliminate most of the film and handwork involved in prepress activities. With steadily improving word-processing computer programs, personal computers and laser printer technology, the staff of the printing industry's "back shop" was beginning to realize computers were capable of doing much of its work, with more precision and with less production cost. By 1993 digital image setting equipment capable of producing a ready-to-mount printing plate showed much of traditional prepress activity would soon become the domain of computer-driven machinery.

By 1997, photography was giving way to electronic imaging systems. What photography remains is controlled by densitometers, computers and automatic processors. Nearly 95 percent of all color separations and corrections are done electronically on scanners, prepress and desktop publishing systems, and halftone output films are generated by lasers. Most stripping is done by computer aided design (CAD) techniques. Color proofs are made from separation films made directly—without a press, and some are made directly from digital data in computers.

Plates are processed automatically and some are made directly by lasers, electrical impulses or spark discharge from digital data held in computers.

On the press, ink fountains are pre-set from digital data, or from data derived from scanning printing plates before they are mounted on the cylinder, and, in many cases, computers are used to monitor the press run and adjust the press accordingly throughout for color correction and quality control.

Although digital technology had been applied mainly to prepress activities up through the mid-1990s, future applications of computer-driven technology promise to revolutionize platemaking and the printing process itself. Already many short-run (100,000 or fewer impressions) projects are being printed by computer controlled four-color copier presses driven by digital images created on desktop publishing equipment.

STUDENT SUPPLEMENT 1

Despite tremendous change in the printing industry since 1950, those in the business should expect even more new technology and retraining over the next 20 years—as much or more, in fact, than occurred from Gutenberg's first moveable type in the 1400s to 1950.

Highlights of the Digital Printing World History

The most important changes have come since 1985 when Apple Corp. introduced the *Apple Macintosh* computer and the *Apple LaserWriter* printer combined with *Adobe PostScript* page description language and the *Aldus PageMaker* software. This combination developed into the plain-paper Typesetter which replaced other typesetting systems using photographic output. This technology put "front end" capability within reach of every business or home with a personal computer. No longer was the printing industry responsible for the creation of blocks of type for printing jobs.

In 1988 the Typesetter became the Imagesetter. *PostScript* produced bit-mapped images which could record illustrations as well as text and could be reproduced by raster image processors (RIPs). Desktop publishing was then capable of producing halftone films of fully composed pages for single-color, multi-color, or process-color reproductions that could be stripped out onto flats for making printing plates.

In 1991 Heidelberg introduced its *GTO-DI*, the first four-color offset digital printing process, which used *Presstek Spark Discharge* technology. Because plates required no wet processing, they could be imaged directly on the press, and printing could be done dry without the need for dampening. This press and the platemaking technology were developed specifically for short-run color printing. Although slow to develop because of poor quality spark discharge imaging and inadequate promotion, the *GTO-DI* was actually a computer-to-plate system.

New developments in 1993 totally changed the perspective on digital printing. *Presstek* introduced **Pearl laser diode ablation imaging technology**—replacing spark discharge—with much higher quality results. Also, Israel's *Indigo* announced **the E-Print 1000 electrophotographic sheetfed Digital Offset Color Press**. And, Xeikon Corp., Belgium, introduced the **Xeikon DCP-1 8-unit electrophotographic web color press**.

By the middle 1990s several firms were assembling systems to put digital printing within reach of small to medium size printers. A good example would be Xerox Corp., and its Docutec system based on Xerox's venerable 5090 black & white copier and/or Docu40 color copier.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

STUDENT SUPPLEMENT 2—"CHANGING EVERYDAY"

How does electronic prepress technology affect a traditional print shop?

We visited with an individual who has watched the changes over the past several years, and who lives with the changes everyday. Her observations follow:

"I used to supervise nine people. Now I supervise four," says Diane Kessler, prepress supervisor at the Oklahoma Department of VoTech Print Shop in Stillwater, Okla. The shop, which produces educational manuals such as the one you are studying, continues to produce more titles and pages each year, despite the reduction in force in prepress.

Ms. Kessler's department had been shifting to computerized prepress activity for about two years when she made the previous statement. "It's changing every day," she said, explaining that digitized equipment, while simplifying prepress procedures, many times complicates the operation and adds to the frustration level of workers involved in prepress activities.

"None of our staff had any computer experience. We went from ground zero to an 8100/80AV Power Macintosh, a RIP 50 and a Linotype Hell Hercules; which at that time was the top of the line," she explained. "As we continue to make progress with our learning curve, we are finding programs that can do automatically what it used to take hours to do manually."

She cited system errors, lack of thorough knowledge of various software throughout our internal and external customer base, and software incapability as the main problems her department faces as it works through the transition to digitized prepress capability.

We asked Ms. Kessler to outline the steps her staff members used in "traditional production," before computers entered their workplace. She explained:

Then

"We usually had to 'tweak' even camera-ready copy that came in to our shop. To produce a curriculum manual; several steps were taken.

First, each page had to be checked visually for inconsistencies.

Then, we would create dummies for our imposition guide.

Then, the job was sent to be pasted up as four page flats which enabled us to shoot the flat on a 20X24 inch piece of film.

STUDENT SUPPLEMENT 2

Once the film was developed and punched, it had to be cut apart into individual pages. The film was then placed in numerical order to match the imposition guide.

From there, the film was stripped by means of placing it on our unique stripping boards and taping it to acetate carriers. Next step was to place the 8-page flat on the light table to check for quality, opaque imperfections and pinholes.

If the job had photographs, a densitometer was used to take the highlight and shadow readings. Each photo had to be shot on film individually to maintain quality and then each had to be stripped into the flat or doubleburned with the flat.

Our final step before plating was to produce blueline proofs which had to be folded, stitched and sent back to the customer for approval.

That was a typical workflow for a staff of nine to produce curriculum manuals.

Now

Today, a staff of five receives digitized job files on a diskette or pinnacles or zip disks—the halftones are already scanned in and linked to the job file.

The file is "opened" (called to the screen of a prepress computer) and checked for inconsistencies. *Photoshop* is used to check halftones and adjust the highlights or shadows directly on the screen. The corrected, or "adjusted," file is then resaved and relinked to be utilized further by other prepress computer programs.

The complete file is saved as a Post-Script (PS) file and sent through another program called *Impostrip Second Generation* 5.0, where it is automatically imposed in signature form once a binding method and number of signatures has been determined. A thumbnail proof is prepared and verified before the file is sent to the imagesetter where the film is created.

The film is then stripped on acetate on the light table and then bluelined full size to be sent to the customer for final approval.

Tomorrow

"We are currently still using film, but this technology is the same technology that is used to produce plates or a final printed product in computer-to-plate and Direct Imaging (DI) systems—totally avoiding the use of intermediate film sheets and stripping flats," Ms. Kessler explained.

When all is working properly, she said, the product from computerized prepress equipment and programs is remarkable.

"The film is imposed with bleeds and trims, register marks, and creep built in. The gripper is set and can even be punched for accurate register.

STUDENT SUPPLEMENT 2

"There is now a program that does the trapping beautifully, and another that checks files to make certain there are no costly errors, missing files, font problems, trapping errors, colors saved incorrectly, or incompatibility between programs. The final film is spotless!"

Job Skills for Printing in a Digital World

"Is the computer making the printer obsolete?", we asked.

"No, printers still have to know how the end product is produced and must know the software well enough to make that happen," Ms. Kessler explained. "But, the 'hands on' jobs will be done by computerized equipment."

"Faced with computerization of prepress activities, what do you seek in staff members?"

1. Good communication skills.
2. Technical skill—the knowledge of printing as it has been, and a willingness to delve into the new electronic applications and their support manuals.
3. Intelligence. The desire to learn and the ability to reason; good comprehensive skills.
4. Neatness. A meticulous devotion to details.
5. Ability to withstand pressures of deadlines, system errors and failures, and demands for perfection in the end product.
6. Dependability.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

STUDENT SUPPLEMENT 3—PRINTING INDUSTRY REFERENCES

Organizations

Printing Industries of America, Inc.
100 Daingerfield Rd.
Alexandria, VA 22314-2888
Voice: (703) 519-8100 (800) 742-2666 (Call for state PIA contacts)
Fax: (703) 548-3227

Graphic Arts Technical Foundation
4615 Forbes Ave.
Pittsburgh, PA 15213
Voice: (412) 621-6941
Fax: (412) 621-3049

Periodicals

The following periodicals feature up-to-date information on digital and electronic printing on a monthly basis. They should be available at larger libraries, or in local printing plants and print shops.

Graphics Arts Monthly
249 W. 17th St.
New York, NY 10011
Voice: (212) 463-6834
Fax : (212) 463-6530
Back Issues: Voice: (303) 470-4000 Fax: (303) 470-4280

Electronic Publishing
10 Tara Blvd., 5th Floor
Nashua, NH 03062-2801
Voice: (603) 891-9159
Fax: (603) 891-0539

Printing Impressions
401 N. Broad St.
Philadelphia, PA 19108
Voice: (215) 238-5300
Fax: (215) 238-5484

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

ASSIGNMENT SHEET #1—COLLECT CURRENT EVENT MATERIAL RELATING TO DIGITAL PRINTING

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student provided relevant examples of periodical material concerning digital printing	_____

Introduction: Because digital technology is making rapid changes in the printing industry on a daily basis, the printing student should know where to obtain the latest information on these changes and their effect on career choices. This exercise will help the student locate current periodical information on digital printing for investigating staffing and training needs in the face of technological changes.

Directions: Using **Student Supplement #3—Printing Industry References**, your local library's *Readers Guide*, and the Internet, collect a minimum of 12 articles from within the past 12 months from printing industry periodicals etc. concerning the staffing and training needs for personnel in the printing industry as it moves further into digital technology. Also, include articles that deal with the changing roles of printer and customer, and the changing viewpoints each might have of cost, competition and service. Make copies of these articles, bind them neatly together and submit them to your instructor.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

ASSIGNMENT SHEET #2—COMPARE AND CONTRAST THE CHANGES IN STAFFING AND TRAINING NEEDS IN A SHOP ADOPTING CTP TECHNOLOGY

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student provided report based on materials collected in Assignment Sheet #1	_____

Introduction: Because digital technology is making rapid changes in the printing industry on a daily basis, the printing student should know where to obtain the latest information on these changes and their effect on career choices. This exercise will help the student determine changes taking place because of digital printing technology and draw conclusions concerning staffing and training needs in the face of this new technology.

Directions: Using information collected in Assignment Sheet #1, and material in Student Supplements #1 and #2, write a report in which you discuss the changes necessary in staffing and training for a print shop which is adopting CPT technology.

Emphasize total numbers of employees needed today versus the past, outline skills those employees may need in today's shop for prepress activities versus those of traditional printing technology, and include a discussion of personnel problems and workflow problems (places where errors might creep in) that might arise as a result of the switch to digital prepress production.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

ASSIGNMENT SHEET #3—ANALYZE EFFECTS OF DIGITAL PRINTING ON THE PRINTER'S AND CUSTOMER'S VIEW OF COST, SERVICE AND COMPETITIVENESS

Name _____ Overall Rating _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student provided report based on materials collected in Assignment Sheet #1	_____
• The report showed evidence of the student's grasp of the changes underway in the industry and how they affect printers and customers	_____

Introduction: Based on information you have gathered in Assignment Sheet 1, write a report discussing the changing viewpoints printers and customers may have on cost, service and competitiveness now that digital technology is changing how a job is generated, handled through production, and produced on the press.

For instance: At one time, a customer brought an idea to a printer, who in turn generated type and graphics, ran a proof and presented it to the customer for approval. Today, the customer may bring a diskette to the printer, complete with text and scanned graphics, and ask the printer to publish the material. What changes in roles have taken place, and how do those changes affect the printer's viewpoint of cost, quality control, service, competitiveness. Conversely, discuss how the viewpoint of the customer—who now brings raw material in the form of digitized text and graphics to the printer—may be changing in relation to the same subjects.

DIGITAL IMPACT ON PREPRESS ACTIVITIES
UNIT VIII

JOB SHEET #1—CREATE A CAMERA-READY LASER COPY OF A PAGE CONTAINING TEXT AND GRAPHICS

Name _____ Attempt Number _____

Evaluation Criteria	Rating
• Student followed directions	_____
• Student produced a finished camera-ready page containing text and graphics	_____

Introduction: Although most print shops have more sophisticated desktop publishing programs at their disposal than many schools, the overall function of DTP programs is the same—the commands and capabilities may vary, however. In this exercise, the student will become familiar with creating a camera-ready laser copy using the instructor-provided computer, DTP program, and printer.

A. Equipment and materials

1. Personal computer and desktop publishing program
2. Laser printer
3. Instructor-provided text file
4. Instructor-provided graphic file (line art, chart/graph, photo)

B. Procedure

1. Run DTP program.
2. Open page file template.
3. Call in graphic file, place on the page, according to instructor's directions.
4. Use word processing program to create headline for text file and place on page near graphic file.
5. Call in text file, flow onto page around graphic, edit text to fit column space.

JOB SHEET #1

6. Check work for accuracy on the screen.

7. Close file and output to printer. Correct errors, if necessary, re-output.